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SCIENCE & TECHNOLOGY

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EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

CONTENTS

QUALITIES, DEVELOPMENT OF ES-8566 VIDEO DISPLAY PRINTER

Sofia ARMEYSKA MLADEZH in Bulgarian No 4, 1984 pp 22-24

[Article by Kostadin Vulchev: "1944-1984, Throughout the Years: Tomorrow's Dialogue"]

[Text] What is the ES-8566? There are very few who could answer this question at the present moment. Literally translated, ES stands for Unified System, and 8566 is the next number according to the computer classification. Let us try to decipher it, though.

The ES-8566 is a terminal station, a complex of video terminals and printers. It would not be an exaggeration to say that by using it, the dialogue between man and machine in Bulgaria acquires a qualitatively new dimension. It has a central group control device connected to a computer through a communication line, to which 7 video terminals and printers can be connected, at a distance of 1,000 meters. This fact alone already says a lot to those who are specialists.

We should mention right away that this is a central component in the ESTEL system for data processing, which won the Dimitrov Prize for its designers in 1982. We read an information bulletin from the Central Computer Equipment Institute, where it was developed, that the ES-8566 offers the possibility of"solving a wide range of engineering, scientific and technical, and administrative management tasks." As a matter of fact, its practical significance is tremendous. It saves quite a lot of time, money, and, not least, nerves and frustration. It is no accident that this is the most sought-after type of terminal in the world.

In this case, through the terminal man enters into contact with the computer, which, moreover, could be at a distance of thousands of kilometers away. Modems (modulators and demodulators) transform signals so they can be transmitted through ordinary telephone communication lines. The terminal itself is a beautiful unit that could be set on a desk, solid and handy for operation. The alphanumeric information is displayed on a screen, similar to that of a television set. The ES-8566, however, has another capability as well, the so-called pseudographics, based on graphic elements, memorized within the system, from which the user can compose drawings, diagrams, schemes, and other things all by himself, and this is a very convenient and

could have wide practical application.

"The pseudographics are priceless," says senior associate Ilich Yulzari, a person with rich experience, knowledge, and authority in the field of computer technology. "In general the ES-8566 is a serious achievement, with contemporary integrated circuits, and it is a microprocessor. Our terminals are microcomputers by nature, though with the appropriate schematic diagrams and programs they can be adapted to be terminals. The whole development is perfectly original and everything is our own, Bulgarian production. For the first time, one of the CEMA member countries has realized a high level of synchronous record for exchange between the terminal and the machine, which is very difficult. It was very complex to make the microprograms themselves. At the same time, the collective took into consideration that the system should be as simple as possible and convenient to operate." By the way, Ilich Yulzari is the leader of the collective which long ago created the first Bulgarian Vitosha-1 computer.

Compared to the latter, the ES-8566 is close to science fiction. I try to imagine how, if back then someone had dared to predict its creation today, his colleagues would have looked at him, what kind of expression they would have had in their eyes. They would certainly have thought he might have been crazy. Yes, it was not possible to have created it 20 years ago, even 10 years ago.

The idea was born in the teleprocessing section of the Central Computer Equipment Institute. The programming council and the higher authorities immediately gave it a green light. Those who had the initiative thought over and evaluated everything in advance: the material basis, the scientific potential, world experience. . . One more important thing: while conceiving it, they were already looking at the market. "In case it did not work, it would have been as if we had done nothing," says scientific associate Atanas Dochev, who is the designer responsible for the terminal station. "When we choose a development, we take into consideration primarily the necessity, purposefulness, and economic effect," adds scientific associate Vid'o Videv, a Dimitrov Prize Laureate, also one of the leading specialists in these tasks.

Whereas for the implementation and serial production of similar developments it was sometimes necessary to overcome mountains of difficulties, things went smoothly here. The Plant for Memory Devices (PMD) in Veliko Turnovo, and most of all its specialists, Angel Kharalanov, Georgi Kabaivanov, and Khristo Gladilov, took the work to their hearts and coordinated everything from the very beginning. The efforts and merits of successful implementation are common; however, mutual cooperation does not stop there. The manufacturer was not left alone in dealing with the realization of the finished production. At the Central Computer Equipment Institute they take care to advertize the product, to show its possibilities, to organize tests, to negotiate with its users. This could be explained to a certain extent by the fact that they are better acquainted not only with the product itself, but with the international situation as well. Here the new economic mechanism has manifested

itself in practice, with foresight and statesmanship. Everything is fine, although it seems to me that this system should become more popular. It is true that international tests have been conducted by the CEMA member countries (the evaluations have been above excellent); it is true that it was displayed at the last Plovdiv Fair (it was awarded a gold medal), and yet. . .

Good things should be said about all those who participated in the development of the ES-8566 (which was completed in a short time), but this is practically impossible. However, we cannot help but mention the names of Emil Yonchev, a Dimitrov Prize Laureate, a leader of the teleprocessing unit, at which the activities of the other sections of the Institute are gathered and coordinated in a focused way, Atanas Dochev, Vid'o Videv, Stoycho Delichev, Yulian Dzherekarov, Petur Raduchev, Ramona Chervenkova, Kiril Kovachev, Lyudmil Maleshkov, Luchezar Nikolov, Ivan Stoev. There is one person, however, in this collective who has special merits, without whose knowledge, experience, and efforts all the others would have given up a long time ago. This is mathematician Mikhail Petrov, leader of the section that created the programming.

I have noticed that people who know what they are doing, the genuine masters in any profession, are usually modest people. It is genuinely painful for them to talk about their achievements. Mikhail Petrov is one of them. "He would never say on his own that he is one of our best programmers." "I doubt that anyone else could have done it, if it hadn't have been for Mikhail Petrov." "The greatest difficulties were related to the internal software. Misho's merits are priceless in this respect; he is the one who sweats the most." This is what his colleagues Dochev, Yulzari and Videv say about him.

Of course it has been difficult, not only for Mikhail Petrov. The burden in this task derives most of all from the fact that everyone was dealing with totally new material. The system had to operate on a new principle, using the most contemporary methods of data transmission. This is not the first device within the socialist community with a network mode of data exchange. There is one more thing worth mentioning -- 100 percent realization has been achieved: hardware, element base, keyboard, connectors, videoterminals, printers, programs, and so forth, everything from Bulgarian, socialist production.

"We started from zero in our section, so to speak," Mikhail Petrov recalls. "And everything had a high degree of complexity. It was necessary to create a synchronous, mesh exchange mode, on the basis of modern mesh records. We did not have such records. We formed our own development of information exchange records between the control device and the rest of the devices in the subsystem. These records are independent and can be adapted to different types of devices. They had to have data transparency, that is, to ensure the transmission of random code combinations."

I listened to Mikhail Petrov, Atanas Dochev, and Vid'o Videv talking about bits, bytes, kilobytes, megabytes, and I don't know what other ways of measuring information, and I thought: how many bytes, and what kind of bytes,

could be used to measure their infatuation with technology, their perseverance and professional ardor, without which nothing great could have happened? They simply said: "We got excited. The topic was interesting. We got swept up. . . "

Naturally, not everything was so simple that one could say· "Well, they sort of made the ES-8566 system." Only they know how much "creative frustration and pain" there was. They were not short on enthusiasm and inspiration, but everyone knows that you cannot go far on enthusiasm and inspiration alone. "There are failures in one's work, there are moments when a certain pressure and persistance are needed," Atanas Dochev said, among his other remarks.

They were making the driver (part of the control system). They had reached a certain amount of information, but beyond that point they had found themselves in a kind of vicious circle. It was necessary to connect the driver to the line so that the other side could work on the same record, which they had to test. Some of Mikhail Petrov's colleagues began to despair, but he encouraged them again. He suggested that they put what they had made up to that moment on the opposite side, at a testing desk (simulator). They also made the desk by themselves. "The interesting thing was that on the very first day of testing, both the drivers began to exchange information," Mikhail Petrov said, smiling.

"This spread around the whole institute, it caused a small boom," Vid'o Videv broke in, "because this communication equipment is, to begin with, very useful, effective and an innovative thing. Different applied programs can already operate on one line."

The quality of the work of these people is not only a word that is used, it is rather intrinsic and comes mostly from the high potential of their products.

I am writing these lines with understandable pride for our specialists who have created this marvelous equipment.

"Strategic productions, and more specifically the production of electronic and electronicized products of contemporary microprocessor devices and systems supplied with the necessary software - there will be developed at higher rates. The work of creating memory devices on new physical principles and with technical and economic parameters which guarantee the high productivity of labor and competitiveness on the international market will be speeded up," This was said in the report presented by the Central Committee of the Bulgarian Communist Party at the 12th Party Congress, and this is what the specialists and workers at the Central Computer Equipment Institute are doing in practice.

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BRIEFS

NEW ELECTRONIC COMPUTER CENTER--The new computer center at the Economic Petrochemical Combine in Pleven is part of the Uniform Information System at the Ministry of Chemical Industry. It performs three kinds of tasks: information tasks -- data processing of finance-accounting activities, planning operation control, sales, material and technical supply; management tasks -- purchasing equipment for modern automation of workshops (installations), and it can manage and control all kinds of processes; engineering -- it can solve all kinds of engineering and design tasks, including tasks related to the combine's foundation for development and implementation. [Text] [Sofia ZEMEDELSKO ZNAME in Bulgarian 15 May 84 p 2] 12334

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RESEARCH POTENTIAL IN ARTIFICIAL INTELLIGENCE DISCUSSED

East Berlin SPECTRUM in German No 3, Mar 84 pp 4-6

[Article by Prof Dr Juergen Kunze, Central Institute for Linquistics]

[Text] After a boom, which lasted until the end of the 60's, automatic language processing also could not escape world-wide setbacks. Some expectations were not fulfilled. But now there are reasons, emphatically to intensify and especially to concentrate on this work - even in our own country.

The paper by Prof Dr N.J. Lehmann in this year's first issue of "Spectrum"[1] offers me the opportunity to propose a somewhat provocative thesis. Its title "As Revolutionary as Print," I would interpret in a more pointed fashion by the following comparison: Until Johann Gutenberg's invention, illiteracy was not uncommon, because written material was generally highly valuable and not everyone could lay his hands on it. When printed matter became a mass product, those who could not write or read found themselves in a social backwater.

What formerly happened in the course of centuries, we now observe as being achieved in decades. There is danger of a second type of illiteracy. Whoever does not know what key to depress with a "menu" on a video display or how "one opens the window" in a few years will be exposed to the pitying smiles of his colleagues and will have to take remedial courses to meet the level of expectation.

Are we then becoming a nation of EDP specialists? Yes and no! Naturally there is a difference between the users and the developers of EDP systems. Already now we are indirect users, and the chair in front of the terminal will become a work place for many. This presupposes qualifications, and to set reasonable limits for this by high user friendliness must be a concern of the very near future. And already we are observing a mad development in the software sector. Thus the way out is not the small, easily understood programming system, but the large, to a certain extent universal, and primarily "intelligent" system, which combines many components within itself, and where the technical programming details are no longer visible to the user.

Enthusiasm does not replace systematic training

This results in another thesis, which I again would like to illustrate by an historical analogy. During the first half of our century, one could measure the economic-technical state of development of the country by figures such as steel consumption or the generation of electrical power per inhabitant. There are many indications that, already by the turn of the century, the per capita EDP capacity will be a - if not the - measure of economic-technical development. Of course, this says nothing about the social quality of the prevailing social order. But in my view, the counting of memories, central processing units, etc. will soon again lose its importance, and will give way to the question, what effects are being achieved thereby. This depends on what scientific bases have been created and invested in for the use (not: for the development) of EDP. In this connection, one need only recall the computer project of the fifth generation in Japan, where just about the only concern is for software requirements in the sense of intelligent performance, while hardware parameters, on the other hand, appear rather as foreseeable developmental trends. The marketing of products concerned with artificial intelligence has already begun in the USA. Systems for automatic translation, information and special systems, are becoming more and more widespread. This surely reflects an existing need, but it does not say very much about the quality of the product. In fact, the users are sometimes severely disappointed. These disappointments primarily result from the inadequate validity of these systems in the sense of the relevant scientific foundations. Automatic translation is an exemplary case of this. A similar situation also exists with other systems in which natural language plays an essential role (e.g. for man-machine dialogue). Further involved are systems where inference mechanisms (logical conclusions about facts) or representation of knowledge make up essential components. International experience shows that such problems can be solved only by long-term and extensive interdisciplinary research. This insight is becoming manifest, and, so to speak, the train hasn't left yet.

Our country has the chance of achieving results in this area which would find international recognition. The key primarily does not lie in working out special programming systems, but in creating user-oriented foundations by well-aimed interdisciplinary research with participation of those disciplines which have a reference to artificial intelligence, such as mathematics, logic, cognitive psychology and linquistics. Hardware solutions also suggest themselves in view of selected problems (e.g. word processors, cognitive processing units).

Among our professional colleagues, the question is sometimes raised "whether now we can also" afford such research. My counter-question then is: Can we afford not to do this? According to my estimation, an appropriate research program is not a matter of four- or five-digit cadre potentials. The keyword here, too, is intensification. The main point is to solve the training problems quickly, to prepare specialized cadres. The previous qualification measures were generally individual actions stemming from insight into development and scientific enthusiasm. This method appears inefficient, time-consuming and not suited for producing strategic scientific changes. It now

seems necessary to me, at least at one of our universities, to set up an extensive training program for artificial intelligence with various specializations so that, at least by the beginning of the 90's, we will have available a suitable cadre. Finally, one must point out the possibilities of using the most modern EDP technology. At this time, there are considerable differences within the GDR. Although the intended projects are primarily basic research, here too the time of pencil and paper work is long past. The scope and complexity of the problems involved require the use of EDP already in the initial phase of research and not only because the research is EDP-oriented. Again, to state things somewhat sharply: Without internationally ranking technology there are no internationally ranking results.

Linquistics and artificial intelligence

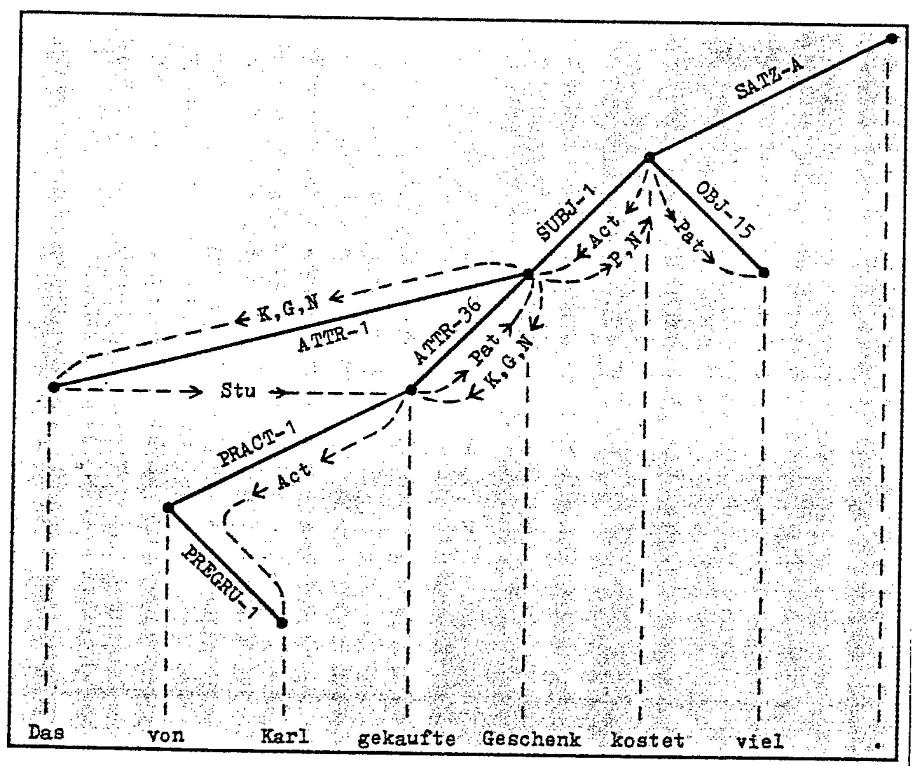
The slogan "information flood" involves almost exclusively texts or other linquistically formulated statements. It makes clear that methods for the processing of texts are today indispensible. However, an entire scale must be considered here, between the classifications of texts for retrieval purposes and "understanding" them. Automatic translation is a rather emotive term here, the first demanding objective of automatic language processing in the first place. Its history has had many ups and downs. The frequently misunderstood ALPLC[2] report from 1965/66 caused a catastrophic decline in research for nearly 10 years. Nevertheless, its two basic statements are as applicable today as they were then, namely:

- teams that are too small and understaffed have no promise of success
- available technologies and means must first of all be used to create the basic foundations (with priority, linguistic ones).

Automatic translation has at the present time a bad reputation world-wide. But the reason for this is not its presumed insolubility, but a lack of concepts or miserly funding. Since the middle of the 70's, an international renaissance can be observed, motivated by the existence of a few enterprises who have passed through the doldrums and now are marketing procedures (although their quality is still inadequate) or who can present interesting experimental results.

Another basic task is automatic language recognition, which means the processing of spoken statements. Compared to the analysis of written language, this introduces a new dimension of difficulty, namely the recognition of acoustic language signals. Despite a highly developed technology, at the present time this is not possible for continuous speech with adequate reliability. The further processing of the output is thus illusory. Incidentally, by means of experiments with "logatoms" (meaningless, but phonetically correct, syllables, without sequential connection), it can easily be shown that even the human acoustic analyzer, the ear, by itself is far from having the suspected reliability. When analyzing and understanding spoken statements, the human person operates in a very complex fashion on several levels simultaneously (grammar and semantics of the language, background knowledge, previous statements, conversational situation, special idiolect of the speaker).

Mutatis mutandis, this also holds for reading, so that such mechanisms must at least partially be converted into automatically achievable strategies when analyzing spoken as well as written language. As a general problem, this is a mammoth task for a language. On the other hand, its solution will also have extremely positive effects on many problems of automatic language processing. Finally, a general analysis of the type sketched above represents the cardinal problem of automatic language processing. - Despite the present lack of general solutions, automatic language recognition has already become quite interesting: There are numerous systems which work for limited purposes with limited means (small vocabulary, severely reduced syntax, clear pauses between words, training phases for individual speakers, etc.). However, these systems are not based on a real analysis, but on pattern matching[3] for entire word forms. For this reason, they cannot be expanded to methods for the recognition of continuous speech.



1. Graphic representation (dependence tree) of the syntactic analysis result. The names on the edges designate syntactic relations, the directed paths grammatical or semantic relations (e.g. Act: doer of the action). Such trees are a preliminary stage for representing the content of a sentence within semantic networks. The latter are the most widespread as formal foundations of the representation of knowledge.

2. Our author, Prof Dr Jürgen Kunze, mathematician and linguist, guides research on automatic language processing at the Central Institute for Linguistics at the Academy of Sciences of the GDR.

The mouth as the human "third hand"

This critical evaluation - and also the concession that some promises have not been kept - should not conceal the fact that all the above-mentioned problems have gained in currency. For automatic translation, this is obvious including even such exotic languages as Japanese. Furthermore, the transfer of information, which previously was practiced in simple fashion, will perspectively go over into a many-branched distribution of information via EDP, which again further increases quality requirements. Spoken language will become more important, because, in many situations there is no other possibility except speaking (e.g. telephone information services, voice broadcasting). Furthermore, with many processes that are controlled by human intervention, the mouth will be able to take over the role of a third hand. There are already examples of this.

For some of the above projects, the scientific foundations were still inadequate. Consequently, more realistic objectives were defined, in the first place the creation of dialogue systems in natural language especially for access to data bases (an essential aspect of user friendliness). Included herein must be various linguistic components, namely an analysis of word forms, combined with appropriate dictionaries, as well as a syntactic analysis which also uses semantic restrictions. These natural language interfaces currently represent an international point of focus. The results achieved are certainly encouraging and this also holds for research in the GDR. Closely connected with this are problems of the representation of knowledge for the most various purposes (research into facts, special systems, combination with analytical procedures). In the development of suitable formalisms and their experimental application, we in the GDR are not merely beginners either.

This task is highly interdisciplinary, since many concerns must be taken into account (linguistic analytical procedures, inference mechanisms, layering of knowledge, generation of responses, clarification dialogue, ...). The representation and processing of knowledge is one of the cardinal problems of artificial intelligence in the first place. After the formalisms, models, and experimental systems, one must always still run through phases in which unimaginable quantities of information must be processed for the individual modules (dictionaries, systems of rules, facts), before maturity for actual application is achieved.

Our own research

At the Central Institute for Linguistics at the Academy of Sciences, research on automatic language processing has concentrated on the analysis of the German language. After the word-form analysis was concluded, we have been working since 1980/81 on the implementation of the syntactic analysis. The

first experimental results will be available in 1985. The intended applications are directed towards communication with data bases. In addition, basic linquistic research is being pursued further. This primarily concerns problems of analysis. As a result of research under contract with the Robotron Combine, a method was presented in 1982 for graphemes-phonemes translation. This represents the first of the two main steps for synthesizing spoken language, and converts the usual orthographic representation of word forms into a representation which exhibits its phonetic form. This problem is certainly not trivial. For example, the dipthongs must be recognized correctly, vowel lengths must be determined, consonant clusters and changes must be specified, and divisions within the word must be found. Words of foreign origin are often pronounced differently than Germanic words. The following pairs of words provide only a small sample of the difficulties at the beginning of a word: angeben - angeln; veranda - verantworten; behende - betende; aberkennen - Aberglaube. Such a procedure profits very decisively from using a word-form analysis. - The second main stage for a speech synthesizer has a phonetic representation as input and produces a regularly intelligible "artificial language". The use of such systems makes it possible to articulate acoustically every stored or (much more important!) automatically generated text. Working out this problem, incidentally, is many times simpler than the achievement of language recognition.

FOOTNOTES

1. Compare Nicolaus Lehmann, As Revolutionary as Print, Spectrum 15 (1984), 1, pp. 1-4.

2. A commission of experts on automatic language processing which was at that time set up by the U.S. government.

3. Comparison of time-organized/spectrum-organized acoustic parameters of the input language signal with stored sequences. The "closest one" is recognized as "correct".

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DELTA COMPUTER NETWORK, TELECOMMUNICATIONS SERVICE

General Description

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 6, Jun 83 pp 6-8

[Article by Prof. Dr. Hermann Walter Meier, Center for Computer Engineering, GDR Academy of Sciences: "DELTA Computer Network: Concept, First Applications Version, Services"]

[Text] Hermann Walter Meier was awarded a doctorate in science at Humboldt University in Berlin and the GDR Academy of Sciences. In 1975, he was appointed Professor of Informatics. He worked in the fields of cosmic radiation and elementary particle physics. Later highlights were automating scientific experiments based on on-line systems and the field of operating systems. He has been working for several years now on the problem of computer network technology and data communication.

Achievements in microelectronics and capabilities of computer network technology are advancing to an increasing extent the transition to distributed processing, the set up of public data networks and the use of telecommunication supported by computers. The purposeful development and application of this scientific and technical progress form a substantial reserve in raising the social efficiency of computer hardware and in making software development and use more efficient.

In consideration of these developments and to create scientific, technical and application advances, the DELTA computer network prototype was developed and the first applications version implemented in a joint effort by the GDR Academy of Sciences Center for Computer Engineering and the Dresden Engineering University. Together with the other articles in this issue, this article reviews the current status and some aspects of the computer network services now in use.

Preface

In the beginning phase of the development of computer technology, the favorable price/performance ratio of large computer systems led to concentration of processing capacity in the sense of central processing. With data teleprocessing, the remote user obtained adequate access to the central computers.

The availability of efficient small and micro computers advanced the trend to decentralized processing whereby the individual could use his own computer resources unaffected by others.

Both concepts have fundamental limitations. The difficulty in implementing safeguards against down time and managing load peaks are examples. Computer resources which are expensive and seldom used are generally unavailable. Operation and use of data banks, of interest to a large circle of users, require additional expense.

By linking computers, the shortcomings of operating computer systems in isolation can be overcome. Distributed processing is aimed at providing users access to all software and hardware resources integrated in the computer network. Also, new telecommunication forms supported by computers are provided by linking resources and expanding user access. In particular, computer networks also implement new communication functions through this aspect besides the conventional processing and storage functions.

An intensive effort has been underway for more than a decade on an international scale to design and develop different types of computer networks. Starting with the first multicomputer systems, the computer communication network was dominant in the seventies when computer networks were developed [1]. In particular, ARPANET [2] and CYCLADES [3] became widely known as pilot systems.

Major results from these projects include development of the relatively independent subsystem communication network and elaboration of the principle of packet switching. The success of these and similar systems over a number of years led to solving the problem of basic communication and to creating public data networks. Based on these mostly national networks, computer networks can be built as applications networks. At the same time, they offer through the communication network a base for comprehensive provision of new telecommunication services, a special class of computer network applications [4].

Considering economic requirements and international trends, the GDR Academy of Sciences Center for Computer Engineering and the Dresden TU [Engineering University] jointly developed the DELTA computer network prototype as the general concept of a non-local computer system. Based on this model, a first applications version was implemented and has been in trial operation since the beginning of 1981.

The aims, system concept, access and forms of use have been covered in various works [5, 6, 7]. The articles in this issue deal with the current status and go into some detail. Future articles will describe the expansion of DELTA and experience in using it.

DELTA Concept and Its Implementation

The DELTA computer network concept is based on decentralized control of hierarchically arranged communication services. It is computer independent and includes as subsystems
--the communication system (KOMET) based on packet switching for the communication function in the sense of basic communication
--the main computer systems (ARS) for processing and storage functions
--the terminal systems (TLS) for access functions.

Each level in the communication architecture makes a communication service available for the level above it or for the computer network user and uses the services of the lower levels in a corresponding way.

The levels are essentially described by
--their functions
--the interfaces for use of these functions by means of the level above it
--the method of addressing
--protocols to control and supervise the information exchange
--the communication channels allocated to them.

The DELTA communication architecture was developed in parallel to ISO action on the Reference Model of Open Systems Interconnection [OSI] [8]. Because of the similar procedure and the international recommendations for interfaces and protocols in existence when DELTA was designed, DELTA architecture levels 1 to 4 to a large extent functionally match the corresponding levels in the OSI model. In the upper levels, both concepts differ with respect to the arrangement of certain functions.

Following the philosophy of level architecture, DELTA has the capability of including new protocols and interface recommendations by changing or replacing individual levels without having to revise the whole communication architecture. With that, for example, the whole KOMET communication system in the DELTA computer network could be replaced by a correspondingly structured data network without having to make major changes in the applications programs.

To verify the DELTA concept, the full model was implemented experimentally and tested. Based on experiences with resource loading, a first applications version was derived for productive operation. In doing so, the BESM6 and Unified System computers are being used as main computer systems.

Fig. 1 shows the links between subsystems in this first applications version.

The computer network can be accessed, i.e. user jobs can be input/output, through
--the local peripherals for the main computer, and
--the local I/O satellites.

Also available as batch terminal systems are
--the terminal systems specific to the main computer system, and
--a terminal system specific to DELTA.

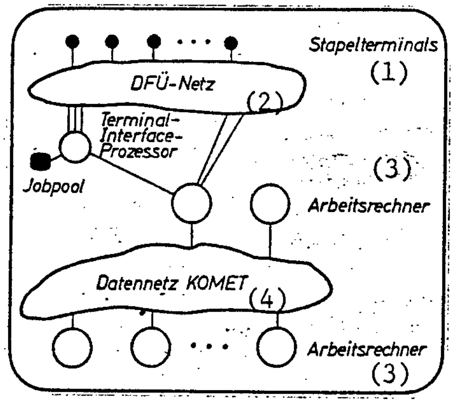

Fig. 1. DELTA computer network subsystems in the first applications version

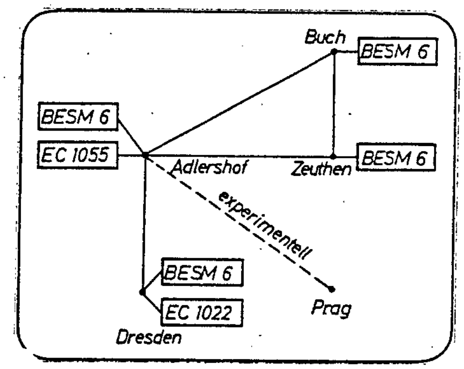

Fig. 2. Topology of KOMET and main computer system distribution (as of the end of 1982)

Key:

1. batch terminals
2. data teleprocessing network
3. main computer
4. KOMET data network

It can be seen from fig. 1 that the main computer system terminals are linked directly through the data teleprocessing network to the main computer system and thus have access to other main computer systems through KOMET.

The terminal system specific to DELTA consists of batch terminals connected to a terminal interface processor (TIP) through the data teleprocessing network. The TIP, implemented as a virtual machine on a local I/O satellite, collects I/O jobs in a job pool and is itself linked through a main computer system and KOMET to other main computer systems.

Fig. 1 also shows that the main computer systems can operate through KOMET in a computer network.

The batch terminals in the DELTA computer network can operate at 1.2 and 2.4K bps in accordance with the data teleprocessing network capabilities.

The KOMET data network topology and the main computer system distribution in the first applications version of DELTA are shown in fig. 2. Within KOMET, mainly fast data lines (48K bps) are used . Data network nodes with lower performance operate with medium-speed lines (1.2 to 9.6K bps). The experimental node in Prague was set up for the bilateral experiment for international data communication between Berlin and Prague.

Computer Network Services

In addition to processing user jobs over the network, other requirements have evolved since the start of DELTA. For one, the need for simple services with

Kommunikations-Form	RN-Subsystem	service Dienst	Kommunikations-Partner	applications Anwendungen
interaktiv interactive	TLS	TL-Kommunikation	TL – TL TL – TIP	• Nutzer-Kommunikation (1) • TLS-Betriebstechnologie (2)
	KOMET	Telegramm	KR – KR	• Wartungs-Kommunikation (3) • Havarie-Kommunikation (4)
	ARS	Operator-Kommunikation	ESER – ESER BESM6 – BESM6 ESER – BESM6	• Produktionsabstimmung (5)
speicher-orientiert storage oriented	TLS	T-Mailbox	TIP	• Nutzer-Kommunikation (1) • Software-Verteilung (6)
	ARS	A-Mailbox	ESER – ESER BESM6 – BESM6 ESER – BESM6	• zeitgesteuerte Operator-Anweisung (7) • Standard-Mailbox „OPERATOR" • „HELP-DIENST" (8) • Entwickler-Kommunikation (9)

Fig. 3. DELTA telecommunication services

Key:

RN [computer network]
TLS [terminal system]
TL [terminal]
TIP [terminal interface processor]
KR [communication computer]
ARS [main computer system]
ESER [Unified System computer]

1. user communication
2. terminal system operation technology
3. maintenance communication
4. malfunction communication
5. production coordination
6. software sharing
7. time-controlled operator instructions
8. HELP SERVICE
9. developer communication

low resource cost has come up. For another, users have asked for expanded I/O functions.

This led to offering a number of computer network services with a graduated scale of performance and functions whereby the resource cost depends on the performance scale.

During trial productive operation, the main applications were
--remote job processing
--file transfer
--telecommunication

Remote job processing involves sending jobs to a remote main computer system, job processing and the transferring the output to a specified location and output device. In particular, remote job processing is used between
--terminals and main computer systems (as a terminal access service)

--BESM6 computer systems (as a job switching service)
--Unified Computer systems (as on-line job processing).

Implemented in the process are
--terminal access
--load sharing
--resource sharing
--data sharing.

By using file transfers (file copy service), data files can be exchanged between the main computer systems, i.e. between
--BESM6 systems
--Unified Computer systems
--BESM6 and Unified Computer systems.

The files to be transferred can be located on any peripheral storage device. For transfer, the service requires a few control parameters such as file names and designations of the sender and receiver. Main uses are transfer of personal data files and I/O information.

The growing importance of telecommunication supported by computers is being matched accordingly by providing various telecommunication services within DELTA. Fig. 3 shows a list of them. Interactive telecommunication is possible between
--terminals (TL) and TIPs
--the ARS [main computer systems]
--the KOMET communication computers (KR).

Storage-oriented telecommunication forms (mail box services) exist in the
--DELTA-specific terminal system
--and within the main computer systems.

With regard to their specifics, the various services have been used so far for these tasks:
--computer center coordination for network operation
--coordination for terminal operation
--operating support for local and network operation
--support during downtime or maintenance
--software sharing
--user communication
--communication between the computer network developers.

The set up and operation of the DELTA computer network based on a general computer network concept, is meeting economic needs and conforming to the international trend of shifting to distributed computer systems. Operation and experience gained so far confirm the efficiency of the DELTA concept.

Through phased expansion of the computer network and development of other computer network applications, qualitatively new capabilities should be made available and various types of pilot solutions for computer network technology developed.

PHOTO CAPTIONS

1. p 7. YeS 8006 modems and MPD 4 multiplexer for data teleprocessing

2. p 8. YeS 7927 video display terminal and BD 4000 printer for interactive output with the YeS 1055

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Software for BESM 6 System

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 6, Jun 83 pp 9-11

[Article by Juergen Rauschenbach, Center for Computer Engineering, GDR Academy of Sciences: "Network Software for BESM 6 Computer System"]

[Text] In 1974, Juergen Rauschenbach completed his studies at Yerevan State University with a degree in mathematics and has worked since then at the GDR Academy of Sciences ZfR [Center for Computer Engineering]. Since the beginning of the project, he has been engaged in development and application of the DELTA computer network, primarily in design and implementation of the transport service.

The BESM-6 software for the DELTA computer network has been implemented within the framework of a BAMOS operating system checkpoint. The file copy service, mailbox service and interactive communication are therefore available within a user task. Load sharing, practiced daily, is based on the file copy service. The user interface for this service contains special statements for standard applications with low demands on the operator. The mailbox service and interactive communication are used both for person-to-person communication and technology support in computer center production areas.

The communication hierarchy of the DELTA computer network matches the architectural principles of the ISO model for open systems [1]. The higher services built on the transport service of the DELTA computer network were developed on the basis of the unified protocol. On-line job processing has been implemented to support job transfer under the Unified System OS only on main Unified System computers.

BESM Network Software Structure

BESM network software has been implemented on a virtual machine (BESM-CP) under the BAMOS operating system and runs as a user task. To service system processes, a subprocess supervisor was developed; it enables generation, control and termination of a maximum of 31 quasi-parallel subprocesses within a CP. The subprocesses are activated according to the scheduling strategy. Subprocess hierarchies can be built. In the network CP, there are network functions for 15 subprocesses. A 16th subprocess is responsible for fetching and filing statistics on an external storage device.

The storage space available to a user job is used in the network CP.

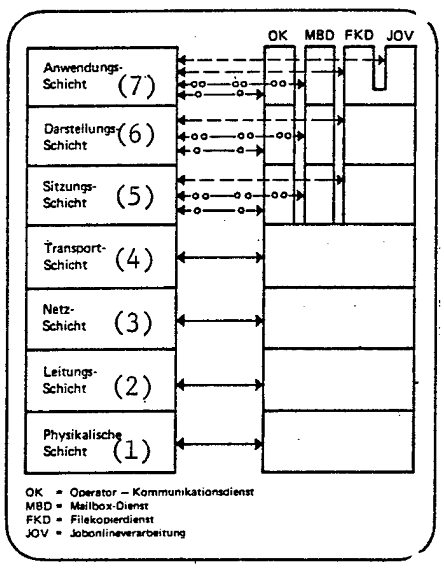
Statistics are gathered at over 200 measuring points in the architectural levels and the interfaces between them. These data are analyzed by a service routine and based on distributions, histograms and means, provide information on protocol operation, time-out synchronization, traffic characteristics and so on. Fig. 2 shows a throughput distribution.

The computer network user has access to network functions through a video display terminal connected directly to the BESM-6. The subprocess concept ensures simultaneous availability of all user services on the BESM computer. Network software is mainly in PASCAL.

Operator communication enables interactive communication between the operators of main computer systems to control network operation. The mailbox service [2, 3] supports input of mail, sends it to the recipient's mailbox and enables retrieving mail from one's own mailbox.

File Copy Service

The file copy service (FKD) is a distributed system allowing file transfer between any main computer system in the DELTA computer network (currently



(1)

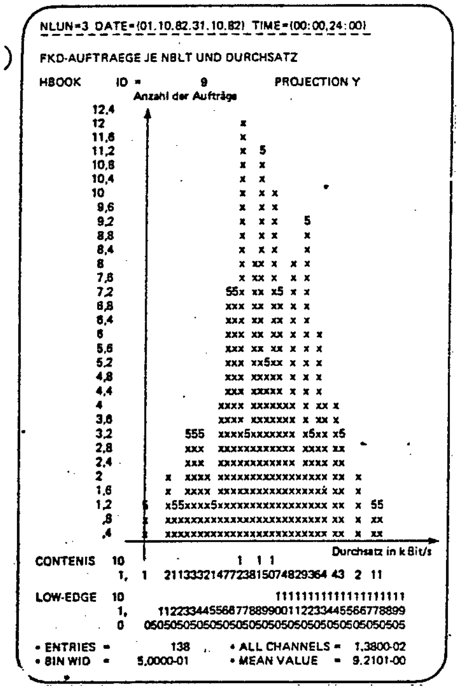


Fig. 1. DELTA computer network communication architecture

Key:

1. physical level
2. link level
3. network level
4. transport level
5. session level
6. presentation level
7. applications level

OK = operator communication service
MBD = mailbox service

Fig. 2. Finding file copy service throughput by the HBOOK method (excerpt)

Key:

1. file copy service jobs by NBLT and throughput
   [y axis] number of jobs
   [x axis] throughput in k bits/s

FKD = file copy service
JOV = job on-line processing

BESM-6 or Unified System computers). The content is transparent for the service. Various data structures are permitted. Currently, the chief file copy service application consists in its use as a basis to share loads and to
--transfer BESM computer user jobs to other BESM computers
--transfer user job output files back to the original computer.

Some 1.5M bytes are transferred daily within a special applications case of the file copy service.

Other applications consist in
--transfer of special jobs and output files (resource sharing)

--transfer of user data files between any main computer system
--transfer of system data files to prepare system changes.

File Copy Service Protocol

The file copy service in the DELTA computer network, in the sense of the TSO model for open systems, includes levels 5 to 7 (fig. 2) [sic] with functions specially tailored for this service such as, for example, the building of a logical connection between two file copy service components based on the DELTA transport service.

The file copy service protocol controls file transfer and has an end-to-end nature. In the start phase of the transfer, the file is identified and its length specified and the file copy service send and receive components agree on transfer mode (transfer of random or sequential files), window width and process codes.

The file to be transferred is segmented into 6,142-byte blocks, which are acknowledged by the file copy service receive component after reception. Correctness of transfer is thereby confirmed at the same time.

If the receipt is not sent, the file copy service send component organizes retransmission of the appropriate blocks.

In accordance with the window width agreed upon, several blocks can be transmitted at the same time.

Introducing this capability produced a major increase in throughput which is shown in fig. 3.

Fig. 3. Throughput for two window widths:

	maximum	interface
window width 1	10 k bps	5 k bps
window width 2	18 k bps	9 k bps

Using more than two window widths produces no appreciable throughput increase since data flows developing in the peak range are too voluminous.

Up to four file copy service jobs can be run in parallel on one main computer system. Other jobs already formulated are put into a queue and processed when resources are available. The files to be transferred are on peripheral storage (magnetic disk, BESM magnetic tapes, 9-track magnetic tapes). File read and write is implemented by a set of procedures which are part of the presentation level (level 6) in the file copy service.

File Copy Service User Interface

Experience gained in almost two years of productive use of the file copy service in daily operations went into the user interface design. For standard applications (data transfer between BESM computers), a short form is used to

formulate the send job in which the destination computer and data set are specified.

Receive jobs are generated by the system and activated by the user by data file assignments. Job status can be queried at any time. The file copy service informs the user of the transfer start and end or when the transfer cannot be made (for example, no connection to the partner file copy service), check sum error and job abend.

The following example shows the job formulation (short form to transfer a random file of 60 tracks (1 track = 6,144 bytes) from main computer system ZFRB06 to main computer system IFHB06. The comments show that a job input file (IF) of 22:11:13 hours with 16 jobs is to be transferred. The file is located on magnetic disk (E = ESDISK) with disk pack designation SYS:B on area 00100. Each job contains a job number by which the later output (for example job end) can be assigned to the respective job. The information to be input interactively by the file copy service user is underlined (fig. 4).

```
Ziel, Traktanzahl   COPY = IFHB06 60   RQN=01
Kommentar                  CMT = IF 22.11./13   16 JOBS
Dateizuweisung             UNIT (E, T) = E   LNUMB = SYS:B
                           LNAME = 00100
```

Fig. 4. Example of job formulation

Key:

line 1. destination, number of tracks
line 2. comments
line 3. data file assignment

After assignment of the data file, a start message is sent which generates a receive job at the recipient station. This may not be accepted, for example, for technological reasons. The reason for rejection is given to the user on the send side in a comments field. When the receive job is accepted, the number of first track to be specified on the receive data file is input (fig. 5).

```
Bereitschaft,   COPY:  RECV FROM ZFRB06 FOR 60 TRACKS RQN+05
Anfangstrakt           CMT: IF 22.11./13  16 JOBS
                       ACCEPTED (Y, N) = Y  FIRST TRACK = 0
```

Fig. 5. Start message generated at receiver

Key:

line 1. readiness to receive   line 2. first track

Then the data file is assigned precisely as at the sender, the receipt for the start message sent, and the start of the transfer indicated to both sides.

Connection? to Job On-Line Processing

Productive use of the DELTA computer network led to another task: transfer of Unified System I/O files between the terminal interface processor (TIP) and Unified System processing computers by using the BESM-6 file copy service. To handle this task, a new function, based on the file copy service by using the BESM-6 network CP, was made available which
1. routes job input files, containing jobs input at a batch terminal, to a Unified System processing computer, and
2. transfers files output by a Unified System processing computer to the TIP for further processing.

With that, the transfer chain between a terminal and a Unified System processing computer has been closed.

PHOTO CAPTIONS

1. p 10. Central unit of YeS 1020 connected as a satellite computer to the BESM-6

2. p 10. VDT 52 100 video display terminal for controlling network operation and operator console for the BESM-6 (made by the Center for Computer Engineering); YeS 1020 peripherals are in the background. Photos (2): Wilaschek

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Terminal System

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 6, Jun 83 pp 12-15

[Article by Ingo Bludau, Wolfgang Blume, Dr. Gertraud Hoffman, Franz Janitzek, Bernd Rieger and Juergen Roemer, Center for Computer Engineering, GDR Academy of Sciences: "Terminal System in the DELTA Computer Network"]

[Text] The terminal system implements access functions in the DELTA computer network. Within the framework of remote

job processing, access is ensured to BESM-6 main computer systems under control of the BAMOS operating system and to Unified System computers under control of the OS/YeS and DOS/YeS operating systems. Moreover, telecommunication services are made available which can be used simultaneously with remote job processing. The terminal system has been in productive operation with a number of terminals since the beginning of 1982.

The terminal system can be used both within the DELTA computer network and for remote job processing on Unified System computers.

Overview

Structure and Method of Operation

The terminal system consists of intelligent batch terminals (DELTA batch terminals) and a terminal interface processor (TIP). The TIP handles the simultaneous operation of the terminals and the link to the main computer systems (ARS). Information input at a terminal or obtained from the main computer systems is stored temporarily in a TIP pool and routed from there to the intended destination: a main computer system or terminal.

To formulate network jobs and operate the terminal, the user has control languages at his disposal to switch the required information to the terminal for I/O, processing and routing of jobs or to create certain operating states.

Hardware and Software Requirements

The terminal system hardware configuration is shown in fig. 1. The Robotron 4201 terminal computers are connected to the YeS 1020 TIP through the manually switched Deutsche Post data network or dedicated lines by using an MPD4 multiplexer. Main storage requirements for terminal system operation are at least 16K words in the Robotron 4201 and 128K bytes in the YeS 1020. YeS 8006 1200-baud modems are used for transmission. The main computer systems are linked by magnetic tape to a BESM-6 by using a two-channel controller.

The TIP operates under control of the DOS 1.74 with the ROTAM basic remote access method. The control program systems ESKO, OSKO or OPSO with the AS8 control program for remote transmission are used for the Robotron 4201.

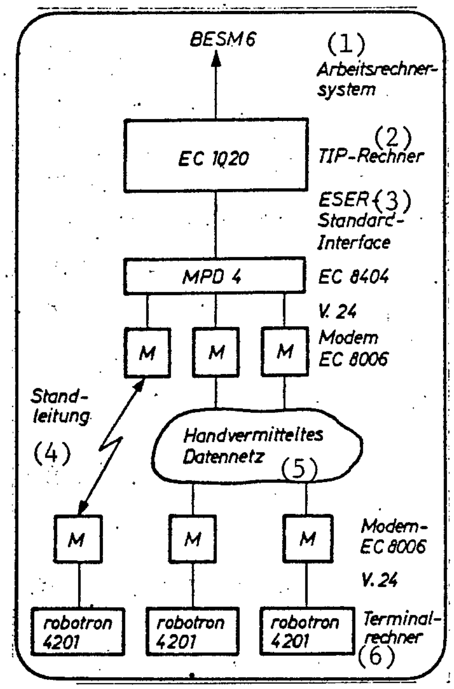
Implementation Principle

System implementation was shaped essentially by the requirement for a high degree of automation and operating reliability [1].

Terminal - TIP data transfer is controlled by protocols on different communication levels to ensure error-free transfer and system reliability. On the upper levels, the DELTA communication hierarchy [2] was implemented with certain restrictions; the lower levels were set up by using Unified System hardware

Fig. 1. Terminal system hardware configuration

Key:
1. BESM-6 main computer system
2. YeS 1020 TIP computer
3. Unified System standard interface
4. dedicated line
5. manually switched data network
6. Robotron 4201 terminal computer



and access methods. Extensive restart capabilities were provided for TIPs and terminals to raise operating reliability of the overall system.

A process communication apparatus was implemented for message exchange between terminal system components which provides a uniform user interface for parallel and asynchronous operating processes on the same or different computers. Tip or terminal functions are integrated into processes. Each process is subdivided into subprocesses which consist of visible program units (modules). With that, a clear and flexible system could be developed which can be generated to meet specific application conditions.

Terminal System Services

Available to the DELTA batch terminal user are
--a remote job entry (RJE) service and
--telecommunication services.

In addition to these basic services, there are a number of auxiliary functions to ensure system operating reliability and flexibility.

RJE Service

The RJE service includes functions for RJE job I/O and for output display and manipulation. The terminal system can handle RJE jobs for the BAMOS, OS/YeS and DOS/YeS operating systems and route them to any main computer system in the DELTA computer network.

When the terminal system is used outside of DELTA, primarily only DOS jobs can be processed. But OS jobs can be processed by magnetic tape links, magnetic tape transport or operating system change. The RJE jobs input at the terminals are first assembled into a main computer system queue by the TIP. From this queue, the TIP puts job sequences together according to selectable criteria and transfers them to the main computer systems. The processing results are received by the TIP from the main computer systems as output files and assigned to the output destination matching the individual terminal queues.

The standard output destination is the RJE input terminal. When the terminal is placed into operation, the terminal user receives information on the number of output files in the queue. Then the output files are automatically transferred according to the FIFO principle. To expand automatic terminal operation, commands to monitor and influence the output are available to the user.

Telecommunication Services

The telecommunication services enable
--interactive communication and
--message exchange (mailbox service [3]) between terminal users or between terminal users and the TIP operator.

Interactive communication presupposes operational readiness of the communication devices involved. In the mailbox service, messages are stored in a mailbox at the TIP. When the recipient's terminal is turned on, the terminal user receives information on the number of messages held for him in the mailbox. Mail can be read by calling it up to the recipient's terminal. Also available to the terminal user are commands to monitor and affect mail output.

User and Operator Interfaces

A job intended for processing on the DELTA computer network consists of the job header, body and terminator. Terminal control language (TCL) statements are used to describe the external structure of a job (job header and terminator) and control job and mail I/O at the terminal. Each TCL statement begins with /TCL and is structured as follows:
/TCL <operation section> <operand section> <comments section>.

The operation section describes the statement type. The operand section can consist of positional and keyword operands. The comments section can contain any character string. During job entry, the TCL statements are processed and written to the logging device (operator's unit).

The job header consists of the JOB, NAME and OUTPUT statement types; the job terminator is the END statement. The body of a job contains programs, data and the job description in the appropriate JCL for the main computer.

The operands in the job header statements contain among others the job class, job names, main computer on which the job is to be processed, and the destination for output of results.

The operator control language (OCL) is used by the operator for terminal operation. An OCL command has the following structure:
<operation section> <operand section>.

The operand section contains only positional operands. Command entry begins with the identifier /T.

Fig. 2 contains some TCL statements and OCL commands used during job entry.

```
              .                                                  (1) Bemerkungen:
              .
              .
              § /T START                                             Aktivierung der Job-Eingabe
   11.52      § KQ                                                         (Kommando) (2)
   11.52 %    I   STARTED                                            Mitteilung über deren Ausführung (3)
   11.52 %    I   /TCL JOB E,JOB A • BEISPIELE FUER TCL-ANWEISUNGEN;
   11.52 %    I   /TCL NAME MUELLER, 8-500-60,03-731-000,300,AB0273,38FYEY;
                                                                     Übertragung abbrechen (Kommando)
              § /T CANCEL I                                                          (4)
   11.52      § KQ
   11.53 %    I   /TCL END • ENDE VON JOB A;
   11.53 %    I   /TCL JOB L,JOB B • BEGINN VON JOB B;
   11.53 %    I   /TCL NAME LEHMANN,1-210-14,04-111-000,300,DE0123,40GYHY;

              § /T STOP I                                            Job-Eingabe beenden (Kommando)
   11.53      § KQ                                                                   (5)
   11.53 %    I   /TCL END • ENDE DER BEISPIELE FUER DEN INPUT;
   11.53 %    I   STOPPED                                            Mitteilung über Beendigung der
              .                                                                  Eingabe (6)
              .
              .
```

Fig. 2. Log output during input of jobs A and B

Key:

1. Remarks:
2. job input activation (command)
3. message on execution of it
4. cancel transmission (command)
5. stop job input (command)
6. message on stop of input

line 4. job A *examples of TCL statements

line 13. end of input examples

System Components

Robotron 4201 as DELTA Batch Terminal

The requirement for terminal user friendliness and reliability called for consideration of the following characteristics during implementation:
--capability of simultaneous use of available services
--highly automated operation
--operator need not be concerned with problems of control and supervision of remote data transfer
--restart capability and robustness against any failure of other components
--parallel operation of peripherals including remote data transfer unit. With that, operator interventions are required only to start terminal functions that are not always active (job entry, mail I/O, output call up, interactive communication and display functions) and to respond to peripheral errors.

Ensuring parallel operation of all terminal functions required assigning them to quasi-parallel operating processes. These are managed by an adapter and control program, the task supervisor (TSV). The adapter function handles the problems of adapting the terminal software to the interface of the KRS [communication computer system] control program system (SPS) used; the control function handles all problems of coordination of the processes implementing the terminal for both resource management and message exchange. Efficient buffer management ensures efficient allocation of free main storage to the simultaneously operating functions and to byte access to information in the buffers.

The terminal software is implemented as a modular applications program system. During generation, it is adapted to the computer configuration and the user's control program system version (SPS). The SPS must serve the following peripherals:
--console typewriter
--perforated tape reader and puncher
--serial printer
--Unified System connector through AS8 (AP62)
--CR600 card reader (if desired).

When operating with the 1220 card reader, its software interface is made available within the terminal program system.

The SPS must meet these other requirements:
--SPS calls for time organization must be generated
--7K bytes is the maximum for the SPS when the equipment has 16K bytes of main storage.

For configurations with 32K bytes of main storage, the full performance range of the terminal, RJE service and telecommunication services, can be generated. With 16K configurations, two terminal program versions are supplied to the user which are appropriately coordinated with each other in their scope of performance.

Terminal Interface Processor [TIP]

The TIP was implemented as a modular applications program within a DOS task. For the TIP process concept, process (TSV) and subprocess (PSV) control supervisors were developed as an extension of the DOS/YeS operating system. The TSV and PSV components contain extensive capabilities for processor and resource management within the DOS task, process synchronization, process cooperation, process and subprocess definition and internal buffer management. Based on the TSV and PSV, a rigorously modular system design was possible.

The TIP consists of three processes (RIPC, OPER and TNAP) matching the functions to be executed. RIPC takes care of all tasks for remote process communication.

The OPER process is used to control TIP operation and to communicate with a remote terminal operator. The TNAP process takes care of all tasks for intermediate storage and transformation of messages and linking to the main computer systems. System HS [main storage] requirements are about 80K bytes for operation of three lines.

The RJE and mail jobs to be exchanged between the TIP and its partner components (terminals and main computer systems) are stored temporarily in a pool data file, which is put on a data medium with direct access. To manage the pool data file, a hierarchical multilist structure based on the DOS direct access method was selected. Jobs are stored in the pool data file in a three-stage form. First, there is a management set for all communication partners known to the TIP, for each of which a list of job anchor sets for the RJE and

mail jobs belonging to them is managed. Each job anchor set manages in turn a list of RJE or mail sets belonging to a respective job. All system information and statistics relevant to a system new start or restart are also gathered in the management set for the pool data file.

Use Experiences

These terminal services are now used by six institutions. Transfer of DELTA batch terminals to other users is planned for this year. Since the start of production use, stable system operation has been provided. This is attributed on the one hand to the support of error-free data transmission by the protocols used, and on other, to a smooth operating technology. In the process, much importance was attached to a high degree of automation in particular. The terminal or TIP operator intervenes in system operation only when he wants to draw on non-standard functions or when orderly operation of the components concerned is no longer assured without his activity. He need not concern himself with all the problems involving remote data transmission.

The system has efficient restart capabilities which are seldom called on in practical operation. For example, when a protocol to transfer an output file is aborted because of serious errors during transmission, the protocol is automatically restarted at the abend point and no information is lost. Should any component fail, through a computer crash for example, a terminal or TIP can be restarted independently of the operation of other active components.

The original operating state is automatically restored as a consequence of synchronization of protocols. The time for the restart of a component is essentially governed by the time required for reloading the operating system. This takes up to two minutes for the terminal and up to three for the TIP.

Data is transferred between the TIP and the terminal in half-duplex mode at a nominal rate of 1200 baud. However, this rate cannot effectively be attained [4]. The effective rate is affected by hardware switch times, the procedure (AP62/64) used, the method for ensuring code transparency and the overhead caused by the protocols. These factors which slow the transmission rate are offset by some measures which facilitate a considerable increase in the transmission rate of useful data, as for example, the compression of useful information. Measurements for some 200 files of all users have shown that the volume of data to be transmitted is reduced 36 percent on the average just by useful data compression alone. Because of these measures, the transmission rate of useful data for output files reached in practical operation is 60 to 80 characters per second. For input files, the rate is somewhat lower essentially because of the generally shorter file length and consequently the higher share of protocol overhead with respect to total file transfer time. For the transfer of output files, this means the transfer rate is in the range of the printing speed of the 1156 serial printer used at a terminal.

PHOTO CAPTIONS

1. p 12. Ingo Bludau holds an engineering degree. Since 1967, he has been working in the field of software development, first at the Robotron

ZFT [Central Office for Research and Technology] and since 1978, at the GDR Academy of Sciences Center for Computer Engineering.

2. p 12. Wolfgang Blume holds a mathematics degree. Since graduation in 1979, he has been engaged in software development.

3. p 12. Gertraud Hoffman majored in physics and received her doctorate from the GDR Academy of Sciences in 1973. She has worked in software for on-line systems, particularly in design and implementation of operating systems for process computers.

4. p 12. Franz Janitzek holds a degree in physics. He was initially engaged in the fields of measuring technology, machine dynamics and analog computer technology. Since 1972, he has worked at the GDR Academy of Sciences Center for Computer Engineering in software development for small computers.

5. p 12. Bernd Rieger has a degree in engineering for information processing. He has been engaged in software development for small computers since 1973.

6. p 12. Juergen Roemer has a degree in physics. From 1970 to 1979, he worked in various fields of applications engineering with Unified System computers at the Magdeburg DVZ VEB. He has been with the GDR Academy of Sciences Center for Computer Engineering since 1979.

The authors have been particularly engaged with the problem of terminal access to computer networks.

7. p 14. With the YeS 1055, the YeS 7927 video display terminal is used to communicate with the ZE [central unit]

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Telecommunication Service

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 6, Jun 83 pp 15-19

[Article by Dr. Wilfried Dames, Dr. Volker Heymer and Klaus-Peter Jerzynek, Center for Computer Engineering, GDR Academy of Sciences: "Mailbox Service on the DELTA Computer Network"]

[Text] The mutual effect of communication technology and information processing in the last several years has produced new forms of person-to-person communication, communication systems supported by a computer. They enable text, video, graphics and voice communication based on computer network technology. The mailbox service on the DELTA computer network is a telecommunication service with which computer network users, who solve their problems by using distributed data processing, receive a communication facility adequate for this form of job processing. It allows drafting messages, sending them to the computer system on which the recipient's mailbox is located, and storing them in this mailbox. The recipient can call for his mail at any time.

Mailbox service on the DELTA BESM-6 sub-network has been in use since 1981 and was extended to the Unified System nodes in 1982. Many of the problems and solutions are not just typical for mailbox service, but also of general interest for computer communication and computer-supported telecommunication. Study and analysis of them is of great importance in the present developmental phase of information processing.

Preface

For several years, a process of mutual effect of communication technology and information processing has been emerging. New switching equipment based on computer systems, especially microcomputer systems, is being developed for communication technology. Following the standardization of packet switching by CCITT recommendation X.25 [1], a standard for an integrated services digital network (ISDN) [2] is now emerging as the basis for data, voice, video and text communication. The new transmission systems have enabled linking individual computer systems to computer networks and have thereby produced a new quality of problem solving by using computer network technology and distributed data processing. The economic effect achieved, ranging from cost savings to opening of generally new capabilities of problem processing, has produced intense activity in the International Standards Organization (ISO) in the field of computer networks. The major result was a reference model for networking open systems [3].

Its architecture also forms the basis for new telecommunication services, computer-supported communication systems.

The International Computer Messaging Service working group WG 6.5 was formed in the IFIP. It defined a message as any combination of text, graphics, video and voice information. A computer-supported communication system for operation with messages should contain these capabilities:
--assemble
--encode
--address
--identify
--send
--query
--comment
--store
--retrieval
--reply
--route.

Computer-supported communication systems can be divided from the applications viewpoint into two groups. The first group includes private systems developed within computer networks to improve communication between computer network users. These include many electronic mail systems [4, 5, 6] and teleconferencing systems [7, 8]. The second group includes public subscriber systems. These now include Videotex [9, 10, 11], Teletex [12, 13, 14] and Telefax.

DELTA Computer Network Mailbox Service

DELTA computer network research and development made special demands on the form of information exchange between widely distributed groups. Customary communication facilities such as telephone and mail traffic did not meet the requirements. Therefore, as soon as experimental operation of the computer network began, a computer-supported communication system was developed which is described by the following:
1. Communication is asynchronous, i.e. possible without the partner being present at the same time. In particular, no interruption of current work or time coordination is required.

2. By incorporating programs of existing computer systems, the information to be exchanged can
--be created and protected by using text processing programs
--copied or archived before sending and
--stored at receiving location and automatically presorted.

3. Compared to customary mail, the messages are machine-readable and can therefore be simply expanded and acknowledged through standard components such as automatic addition of sender, date and time.

With this system, DELTA computer network users, who solve their problems by distributed data processing, obtain a communication facility adequate for this form of job processing which is available both on main computer systems (BESM-6, Unified System/OS) and in the terminal system.

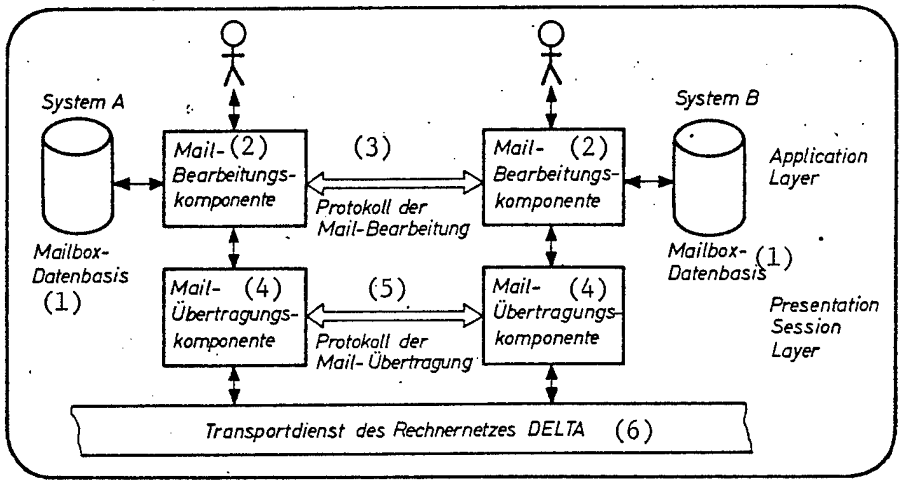


Fig. 1. Model of DELTA mailbox service

Key:

1. mailbox data base
2. mail processing component
3. mail processing protocol
4. mail transmission component
5. mail transmission protocol
6. DELTA computer network transport service

Logic Model of Mailbox Service

The logic model of the DELTA mailbox service conforms to the ISO reference model (fig. 1). The standard basis for the mailbox service, just as for other DELTA computer network services, is the DELTA transport service. Application layer functions are used by the mail processing components; session and presentation layer functions, by the mail transfer components.

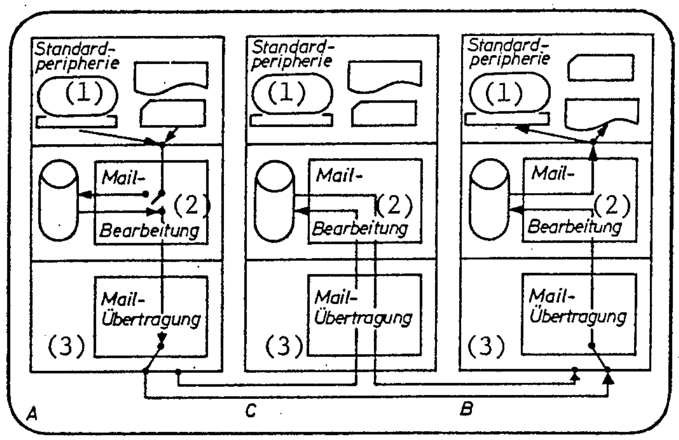
Mail Processing Component

Mail processing component functions can be represented by the path of mail from its generation to reception by the partner (fig. 2).

The user inputs mail by using the mail processing component. User authorization is by password. Mail is input according to the input medium capabilities of (display, punch card, prepared file ...). The mail is automatically expanded by entry of the sender, mail input date and time and maximum duration of mail within the mailbox service.

The mail transmission components are called according to the addressing and control information on the mail recipient (also the accepted character codes of receiving system, among others). When the mail has been transmitted successfully, it is available in the recipient's mailbox data base and can be read there by the recipient (display, printer) and copied or archived as needed. Here too, access is protected by password. The recipient has access

Fig. 2. Path of mail sent from system A to system B (system C can function as a relay system)



Key:
1. standard peripherals
2. mail processing
3. mail transmission

only to mail stored in his own mailbox. After expiration of the maximum storage time, the messages are deleted and released for automatic printout. Automatic output can be suppressed for confidential mail.

When mail cannot be placed in the recipient's system, (e.g. recipient unknown, mailbox full), the sender receives a message with the reason for non-delivery from the mail processing component. Depending on the type of error and the capabilities of the specific implementation of the mailbox system, automatic correction by repeating the transmission can also be tried. When there is no transmission capability at the time the mail is sent, the mail is temporarily stored in a relay mailbox system. The mail will then be sent later when a link between the relay and recipient system is available. With this method, communication between systems which are not available at the same time because of technological conditions will still be possible. The DELTA mailbox service is designed so that any mailbox system can function as a relay system. There can be several relay systems on the network.

Mail Transmission Component

The mail transmission component handles mail between two mailbox systems based on the protocol shown in fig. 3. Mail sent from the processing component is provided with a protocol header by the mail sender and in parallel with current transmissions is sent over the existing link to the appropriate recipient. Messages sent in parallel are distinguished by a message number in the header. Each transmission is acknowledged by the mail recipient by mail number, whereby the result of placing the mail in the recipient's box is included as the data section in the receipt. The receipt arrival time is monitored by the mail sender.

To simplify buffer management and define restart points, the data unit for a mail transmission protocol has a maximum length of 803 characters (11 message lines with maximum of 73 characters each).

Longer mail is sent as a series of so-called pages. A page number is part of the protocol header. Mail disassembly and assembly is a mail transmission component task. When complete transmission of all pages making up a message is not possible, it can be resumed at any time after the last page

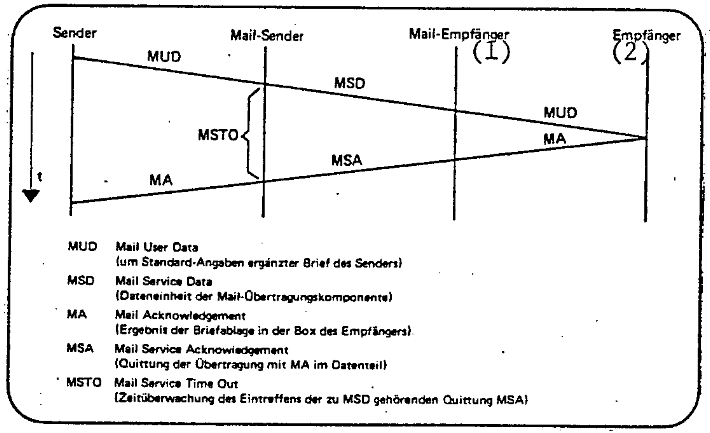


Fig. 3. Mail transmission protocol procedure

Key:

1. mail receiver
2. recipient

MUD: Mail User Data (sender's mail expanded by standard entries)
MSD: Mail Service Data (data unit of mail transmission component)
MA: Mail Acknowledgement (result of mail placed in recipient's box)
MSA: Mail Service Acknowledgement (receipt of transmission with MA in data section)
MSTO: Mail Service Time Out (time monitoring of arrival of MSA receipt belonging to MSD)

successfully acknowledged. The mail is then available to the recipient only after all its pages have been sent without error. According to [3], the pages and messages have the character of recovery or quarantine units.

Mailbox Service Implementation

The mailbox service has been implemented on both the BESM-6 and Unified System computers and Robotron 4201 terminals [15]. We should first present what is common in this implementation for the main computer systems.

Besides the basic commands for mail I/O, the user interface offers a number of auxiliary functions which allow an overview of mail (number, sender, number of lines), output of useful statistics and the fill state of the mailbox data base. There are also privileged commands for data base initialization and for logging the mailbox user on/off. The user name can have a maximum of 12 characters. In addition to his own name, a user can be addressed by aliases (e.g. by his function, as "director").

Collective names are allowed for user groups.

The full external address of a user is formed by data base names (6 characters) and unique user names there. The mail transmission component assigns data base names to a recipient system.

Since the effect of the mailbox service depends to a large extent on user acceptance, the user interface design provided a simple formulation for standard jobs and short forms for the experienced user. Sending and receiving mail by the user is possible in parallel and independent of transmissions for the same reason. A starting point for implementation was the simplest possible linking of mailbox service to the existing technologies of the computer centers. For this reason, access includes both the interactive forms available in suitable systems through terminals and mail I/O through batch jobs. Mail can be input or output through standard computer peripherals. Considering the devices available in DELTA, a maximum line length of 72 characters was fixed as a compromise between terminal and punchcard input and output to a terminal or printed in A4 format.

The main implementation language is PASCAL for both the BESM-6 and Unified System computers. It proved its value as the standard language for DELTA software.

Implementation for BESM-6 Computers

On the BESM-6, the mailbox service is part of the network process [16] that provides all computer services. Jobs are formulated interactively using a video display terminal. Mail is processed and sent in parallel with processing of jobs of other services.

A standalone service process which is activated as needed performs functions such as user log on/off, printing of mail, compression of the mailbox data base and others.

Fig. 4 shows the relation between the mailbox service in the network process and the mail service process.

Implementation for Unified System Computers

In implementing the mailbox service for the Unified System, consideration was given to the broad spectrum of devices and available resources to place the fewest restrictions on applications. Thus, the mailbox software package has only a few interfaces to the operating system and has the nature of an applications program.

I/O is by sequential files with all the types of devices and statements possible in OS/YeS. In particular, problem-free use of the mailbox service within the TSO is thereby possible since here terminal I/O through the TCAM can be handled as sequential files. Thus, the mailbox controller is not burdened with all the problems of terminal properties and control, and the batch software is largely identical to the interactive software.

The normal input stream by punchcards or terminal can also be replaced by a prepared file.

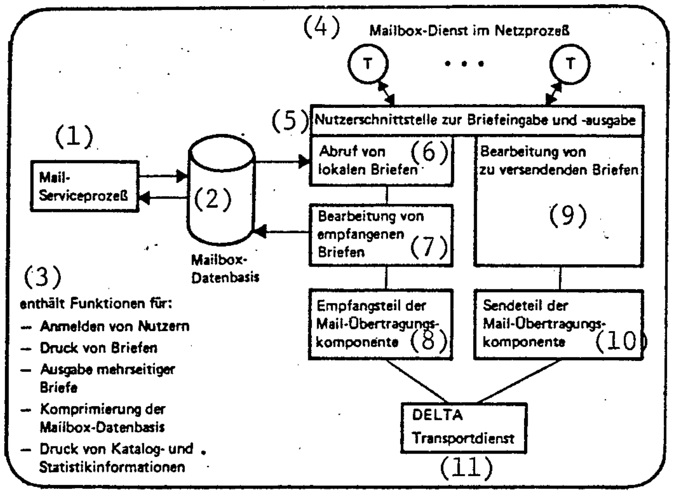


Fig. 4. Mailbox service for BESM-6 systems

Key:

1. mail service process
2. mailbox data base
3. contains functions for:
   --user log on
   --printing mail
   --output of multi-page mail
   --mailbox data base compression
   --printing catalog and statistics
4. mailbox service in network process
5. user interface for mail I/O
6. call up of local mail
7. processing of mail received
8. receive portion of mail transmission component
9. processing of mail to be sent
10. send portion of mail transmission component
11. DELTA transport service

Pre and post processing of mail text can be performed through the facilities available in OS (IEBUPDTE, TSO-Edit, PORG of UNI2/3, ...).

Several users have access to the mailbox data base at the same time; access is synchronized by ENQ and DEQ operations. The data base is organized on the basis of the BDAM [basic direct access method] according to an access method which allows I/O of any size of storage section of a byte-addressable direct access storage device without gaps irrespective of block size (according to disk type and buffer requirements) and block boundaries. Thus, e.g. catalog structures are independent of specific device and resource conditions.

Using PASCAL combined with the OS overlay technique for groups of PASCAL programs produced an efficient implementation with respect to both the programs and tests proper and main storage loading. Much importance was also attached to allowing local work with the mailbox service when the Unified System is not on the network. For this, the local mailbox data base is generally used as a relay box for mail to be sent (fig. 5). With that, the mail input for acceptance by the network operation is stored and different input and transmission rates (e.g. for batch input) during the network operation are compensated for.

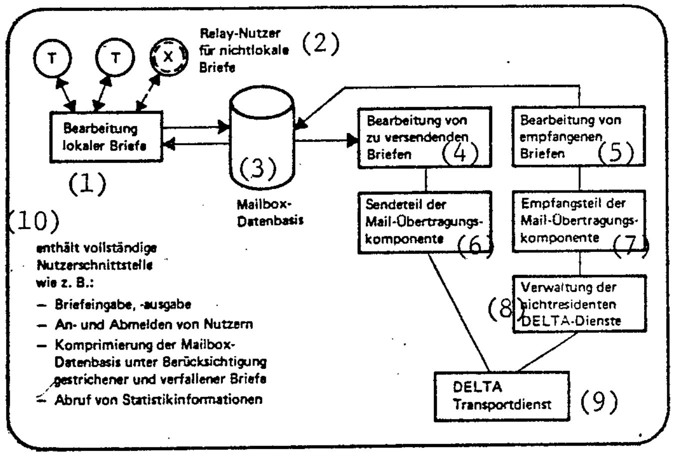


Fig. 5. Mailbox service for Unified System computers

Key:

1. local mail processing
2. relay user for non-local mail
3. mailbox data base
4. processing of mail to be sent
5. processing of mail received
6. send portion of mail transmission component
7. receive portion of mail transmission component
8. management of non-resident DELTA services
9. DELTA transport service
10. contains complete user interface as e.g.: mail I/O, user log on/off, mailbox data base compression with consideration of deleted and expired mail, call up of statistics

When network operation is started and at certain times during operation, a process is set up to send the mail placed in the relay box.

Similarly, a receive process is dynamically generated when mail arrives.

Communication between the network core process and the mailbox processes is implemented by using the process communication developed for the OS/Yes [17].

PHOTO CAPTIONS

1. p 15. Wilfried Dames received his doctorate in information processing at Berlin's Humboldt University in 1975 and has worked since then at the GDR Academy of Sciences. Up to now, he has been engaged in developing software for computer communication. His fields of interest are the architecture of computer networks and communication protocols.

2. p 15. Volker Heymer earned his degree in mathematics at Moscow State University imeni Lomonosov and received his doctorate at the GDR

Academy of Sciences in 1973. After working on operating system development for large computers, he moved on to computer network problems. He works in the fields of computer network architecture, protocols for the transport and higher levels, protocol specification and computer network use.

3. p 15. Klaus-Peter Jerzynek received his degree in mathematics at the Karl Marx Stadt Technical College in 1976. He then worked as a scientific associate at the GDR Academy of Sciences Center for Computer Engineering on developing the DELTA computer network. Since 1982, he has been the associate responsible for the topic at the Center for Robotics and Microelectronics of the Berlin VEB for Efficient Manufacture of Clothing.

4. p 17. Rows of YeS 5061 magnetic disk storage devices

5. p 18. YeS 7031 parallel printer by Robotron

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Data Communication Berlin, Prague

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 6, Jun 83 pp 19-21

[Article by Hans-Martin Adler, Dr. Dieter Hammer, Dr. Hermann Walter Meier and Dr. Rudolf Sommerfeld, Center for Computer Engineering, GDR Academy of Sciences; and Dr. Mirko Novak, Center for Computer Engineering, CSSR Academy of Sciences]

[Text] In 1982, a data communication experiment was set up between Berlin and Prague, based on the KOMET packet switching network used on the DELTA computer network, to study the problems of international data communication and test typical uses of data communication. By using the administrative services available in KOMET, evidence on data network availability and performance behavior was gathered. To study data network applications, experiments were conducted with selected users. The experiment was terminated successfully after six months of operation.

Data Communication Changes Information and Work Processes

In the last decade, a technology has formed with data communication which has changed information and work processes to a considerable extent internationally. This computer network technology has produced a rapid rise in the use of data banks, efficient capabilities of using territorially distributed computer resources and new forms of person-to-person communication.

Development of data communication for research is a task with which the academies of socialist countries are concerned in their multilateral cooperation.

In doing so, the focal points are
--international coordination of national network activities in research
--initiation of bilateral and multilateral studies to prepare the set up and operation of an international computer communication network for selected research institutions in the socialist countries
--development of computer network applications for research with special emphasis on capabilities of data communication as a means for supporting and intensifying international research cooperation.

A chief form in pursuing these goals is the bilateral experiment in data communication. Proceeding from an analysis of capabilities and conditions for the performance of this type of experiment, these decisive goals were set:
--test software and hardware solutions for terminal and computer networks
--study widely distributed computer systems
--determine the utility of international communication paths
--gain experience in cooperation between computer network operators and message management in the participating countries
--gain applications experience with pilot applications of international data communication.

Based on the DELTA computer network concept [1] and pursuing the long-term goal of connecting this computer network to the terminal network of the Czechoslovakian Academy of Sciences, a data communication experiment between the GDR Academy of Sciences Center for Computer Engineering in Berlin and the CSSR Academy of Sciences Center for Computer Engineering in Prague was prepared and conducted in 1982 (rd [RECHENTECHNIK/DATENVERARBEITUNG] No 8, 1982, reported on the start of the experiment, called the BPE [Berlin-Prague experiment] from here on).

The BPE was aimed at
--investigating problems in international transmission based on the packet switching principle [2]
--testing typical applications of data communication in research.

In all phases of the BPE, advice and clarification on technical transmission problems were given in close coordination with the institutes for post and telecommunications of the GDR and the CSSR communications administrations.

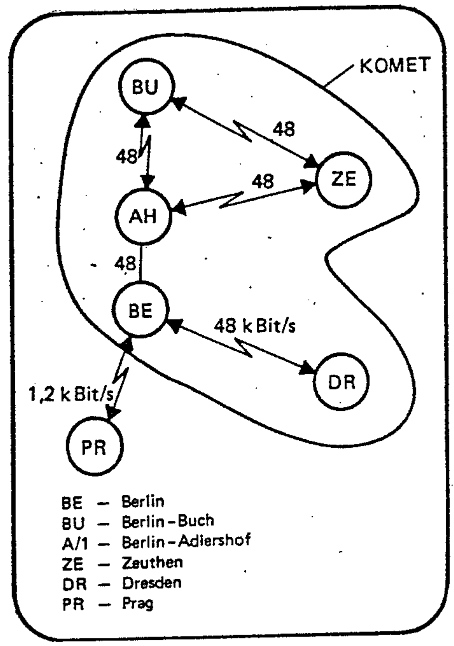


Fig. 1. Topology of KOMET with the Prague connection

Computer and Communication Hardware Basis

The BPE was based on the KOMET packet switching system [3] in using the DELTA computer network concept.

The hardware base consisted of the Robotron 4201 small computers equipped as communication computers
--the GDR Academy of Sciences DELTA computer network KOMET packet switching system
--the CSSR Academy of Sciences computer and terminal network.

The KOMET packet switching system met the experimental conditions at the start, but had to be set to the designated rate of 1.2K bps. It has comprehensive administrative services for observation and analysis of the entire network and system measurements [4].

Fig. 1 shows the linking of the Prague Robotron 4201 node into the KOMET packet switching network for the BPE. Fig. 2 shows the hardware configuration for the connection.

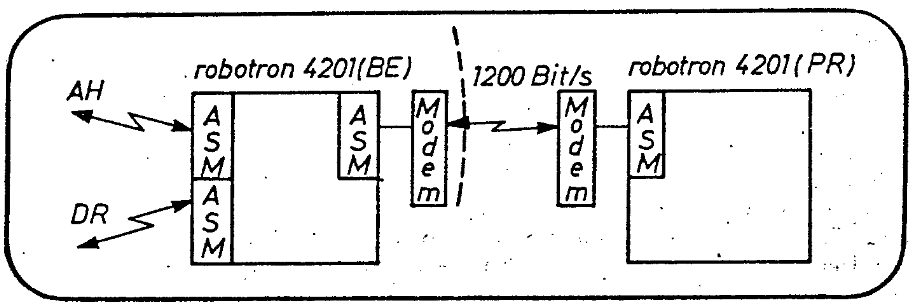


Fig. 2. Hardware configuration for the Prague node connection to KOMET

In connection with limiting the BPE to the problems of the packet switching network, a software system for a special perforated tape transmission service (LB service) was developed in order to be able to study the first pilot applications under these conditions as well.

Experiment Organization and Course

The essential prerequisites and additional conditions for the BPE were:
--no interference with the packet switching service made available by KOMET

for the operation of the DELTA computer network
--keep interruptions to the YeS 1040 terminal system operations in Prague to no more than absolutely necessary.

For this, it was necessary to include the personnel working at the computer centers, the maintenance personnel and the appropriate scientists in the experiment. In both computer centers, separate arrangements were made to ensure the undisturbed course of the experiment since both computers executed additional functions during this time. These included:
--output of experiment statistics at the Berlin nodes
--independent generation of packet streams between Berlin and Prague upon each new start of the system
--automatic reports from KOMET network operations to Prague too.

Considering the restrictions for the BPE, the planned tests were performed in routine operation. After successful completion of the first test, all further studies until different test environments were set up were able to be performed without supervision because of KOMET's high degree of automation. With that, the Robotron 4201 in Prague operated under the same conditions and in the same manner as the other node computers in the KOMET packet switching network. For special load tests, low traffic periods were used.

System Behavior

Special data streams were generated and transmitted by both parties to assess the availability, reliability and performance of the international network.

Also for current KOMET statistics for statistical analysis, statistics related to the experiment were gathered. The data gathered at both nodes were sent to Berlin nodes and output there on perforated tape by using standard KOMET statistical packages. Active on a standard basis were 22 measuring points.

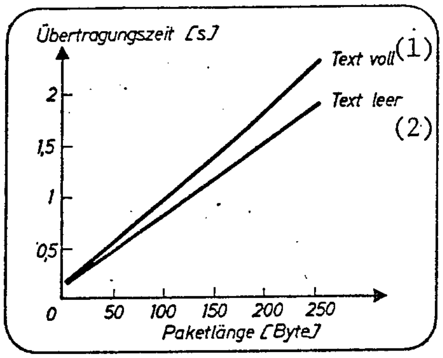
Network availability was essentially determined by the availability of lines. During the time of the experiment, the network was always available. The Prague node was able to be connected at any time without prior notification of the post administrations. This connection was made many times with no problems outside the fixed test times.

Data network reliability was essentially governed by the hardware components used in the experiment, such as the Robotron 4201, modems and data circuits, and the KOMET software system. Both KRS [communication computer systems] showed stable behavior during the experiment.

To assess performance, maximum throughput rates for selected data streams generated at high frequency were studied.

With data streams as a series of packets, different packet lengths were used to simulate typical use conditions.

Figs. 3, 4 and 5 show the results from this performance measuring.



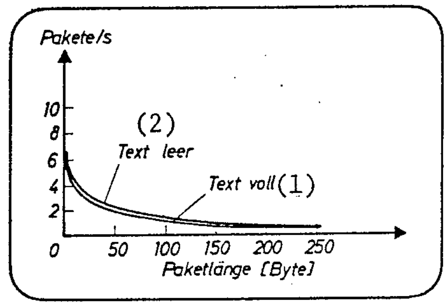


Fig. 3. Relation between transmission time and packet length

Key:

1. transmission time (s)
2. packet length (bytes)
3. full text
4. null text

Fig. 4. Relation between packets sent per second and packet length

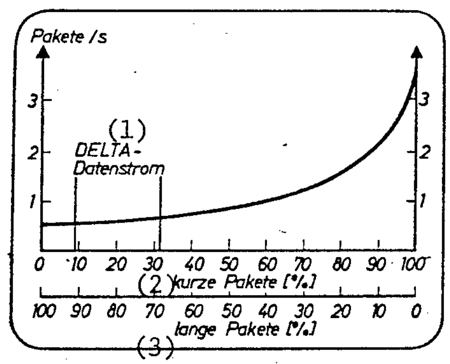
Key:

1. packets/s
2. packet length (bytes)
3. full text
4. null text

Fig. 5. Performance with mixed packet streams

Key:

[y axis] packets/s
1. DELTA data stream
2. short packets (%)
3. long packets (%)



A basic load test yielded evidence on the data network behavior, taking the additional condition that the KOMET network was not overloaded into account. For this, the KOMET system was generated so that it automatically produced the appropriate data streams upon each restart between Berlin and Prague without operator intervention.

The send frequency selected in both computers was three seconds. This frequency ensures that with an average transmission duration of 2.3 seconds, no queues form to the computers, but the line is always in use. The maximum packet length was 254 bytes. The packet streams were so-called DROP streams which were destroyed at the respective destination nodes.

Statistics gathered during the basic load test were put on perforated tape every half hour. The analysis dealt primarily with transmission errors and integrity of the packets transmitted. In a half hour, 600 packets were able to be transmitted in both directions. Line load was about 60 percent.

Some changes were made to the basic load test (change in packet text lengths, raising the send frequency to Prague, change in packet text content). In the node computers, there was no measurable impairment of data transmissions made during this time in KOMET.

To check the functional capability of the Prague KOMET system working together with the KOMET network, packet streams were sent through several nodes and ECHO streams studied. Berlin initiated them. Prague was the source of the streams; destination nodes were in KOMET.

Applications Experiments

The applications experiments were pilot types focusing on these typical uses of data communication:
--access to data banks available and updated in only one of the computer centers connected
--exchange of data available in same type of data banks at different partners
--exchange of real-time measurement results for immediate processing in the various centers.

The partner institutions exchanging data under the so-called user aspect supported research in geophysics and molecular biology.

The applications experiments were used primarily for preliminary study of the capabilities of data communication and derivation of special requirements. At the same time, they referred to the new type of capabilities for research which result from immediate use of data from research projects in international partner institutions.

Conclusions

At the successful end of the Berlin-Prague experiment, a number of statements on the implementability and quality of bilateral data communication based on packet switching technology between the GDR and the CSSR were evident:
--The DELTA computer network packet switching system allowed connecting productively operating data network nodes in the CSSR.
--The transmission lines provided by both communication administrations were of exceptionally high transmission quality.
--The data network performance results matched conceptual expectations. The estimated line limits were reached. The transmissions also passed with no problems and with the required reliability when sections with different transmission rates were used.
--The first applications experiments were also able to be performed by perforated tape transmission and telegram service without the connection of the main computers and without placing additional requirements on the user.

PHOTO CAPTIONS

1. p 19. Hans-Martin Adler holds an engineering degree. Up to 1976, he was engaged in process computer applications with regard to accessing large computers. He then helped develop the KOMET packet switching network and was concerned with administrative functions, the path selection algorithm and the link to main computers.

2. p 19. Dieter Hammer received his doctorate in 1974 in operating system development and in 1981 in data communication. He was appointed a professor of informatics in the GDR Academy of Sciences in 1982. His fields are data communication and computer architecture.

3. p 19. Rudolf Sommerfeld received his doctorate in engineering from the GDR Academy of Sciences in 1973. Since 1966, he has been working in information processing, specializing in process computer technology and on-line systems. He has been engaged for a number of years in design and implementation of data communication systems based on packet switching.

4. p 19. Mirko Novak received his doctorate in electronics and communication technology at the Prague Engineering University. His scientific interests include network and systems theory. He has been working for several years in the fields of automating scientific experiments, computer and terminal networks. He is also engaged in the theory of tolerances of intricate hardware systems.

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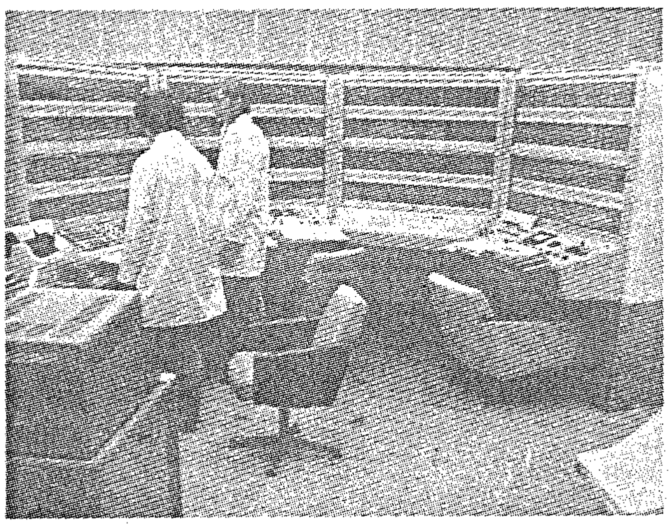
Photo of BESM-6 Computer

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 20 No 10, Dec 83 p 26



[Photo Caption] The large Soviet BESM-6 computer is the nucleus of a protein data bank used at the Central Institute for Molecular Biology (ZIM), Berlin-Buch, which is connected to other Academy of Sciences institutions by remote data processing through interfaces.

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OPTICS, PRECISION INSTRUMENTS AT 1984 LEIPZIG SPRING FAIR

East Berlin DIE WIRTSCHAFT in German 1984 Leipzig Spring Fair Issue pp 19-21, 24

/Advertisement by VEB Carl Zeiss Jena Combine, Jena/

/Text/ The exhibitions of the Combine VEB Carl Zeiss Jena are an example of further continuous increase of performance even under the complicated conditions of the world economy:

During the last 5 years, 75 percent of the product spectrum was updated, which corresponds to the current pacemaker tempo of international innovation processes. Thus, in 1984, the supply of products also contained more than 30 new and improved developments.

Highly effective microelectronics causes a further increase of productivity. In conjunction with new optical and mechanical precision solutions, it gives rise to further increases in the quality, accuracy and performance of the exhibits.

100 years of JENA GLASS - 100 years of quality glass - a precondition for high-grade optics as another prime element of optical precision instrument construction.

Figure Caption: A party delegation from Czechoslovakia also visited the exhibit of the Combine VEB Carl Zeiss Jena at last year's Leipzig's Spring Fair. The members of the delegation were: Milos Jakes, Member of the Presidium and Secretary of the Communist Party of Czechoslovakia (second from the right), Josef Lenart, Member of the Presidium of the Central Committee of the Communist Party of Czechoslavakia and First Secretary of the Central Committee of the Communist Party of Slovakia (center of the picture), Rudolf Rohlicek, Acting Chairman of the Government of Czechoslovakia (third from the right), and Pavel Sadovsky, Embassador of Czechoslovakia to the German Democratic Republic (second from the left). The delegation was accompanied by Dr. Günter Mittag, Member of the Politbüro and Secretary of the Central Committee of the SED (left). General Director Dr. Dr. h.c. Wolfgang Biermann (right) introduced the exhibit of the Combine.

Photogrammetric Instruments

Three technological lines were exhibited under the topic "From the Measurement Image to the Map":

Recording Technology and Digital Metric Picture Processing for Geo-exploration. The multispectral camera MSK 4 and the film input/output unit FEAG within the framework of the picture processing system of the Combine Robotron were instruments that were introduced in 1983 and that now stood in the foreground. To demonstrate the recording process and for analog evaluation/interpretation, this technological line is supplemented by the multispectral projector MSP 4 C. An MSK 4, mounted in an L410 aircraft of the Interflug, is located on the Leipzig Airport ready for demonstration.

Map production and supplementation with the principal exhibits, the aerial photography system LMK, computer-supported stereo mapping system - consisting of the proven stereo-mapping unit TOPOCART D with the digital table DZT 90 x 120/RGS - and the recently developed map-supplementation unit KARTOFLEX.

Industrial and Architectural Surveying

Even with objects that are very rich in detail, the metric data are gathered with optimal adaptability and highest precision by the versatile photographic system, universal measurement chamber UMK 1318 and by photogrammetric evaluation instruments. The anti-distortion unit RECTIMAT C is being demonstrated with applications from industry and aerial photogrammetry.

Furthermore, software programs, scientific documentation, as well as application documents from many application areas belong within the spectrum of accomplishments of this tradition-rich area of instruments - Jena is the cradle of industrial photogrammetric instrument construction. The complex of instruments concerning remote sensing of the earth, from photographic techniques in aircraft and spaceships up to the modern evaluation and duplication techniques underscores the high state of development of scientific-technical collaboration with the USSR. Thus the topical conception of earth exploration and surveying can be pursued further, from the Second UN Space Conference UNISPACE, Vienna 1982, and from the 1983 Leipzig Spring FAir, up to the ISPRS (expansion unknown) World Congress in August 1984 in Rio de Janeiro.

Geodetic Instruments

The exhibition profile comprises the electrooptic tachymeters RECOTA and RETA including the recently developed data transfer and control unit DTK 1/remote data transmission as well as the digital drawing table DZT90x120/RS with an HP computer; the leveling series A and the high-precision leveling instrument NI 002;
Theodolite-Type Series B --
Two application areas are being presented this time as application focal points of the exhibits:
Industrial Surveying With More Stringent Requirements --
The new type series of leveling instruments is matched to the special measurement conditions in industry, such as unfavorable light and space conditions, work at dangerous sites, etc. The corresponding functional elements and accessories, such as illumination equipment for the instrument and lath minimum focusing

distance 0.4 m, instrument console, pivoting ocular, functional control in the telescopic image, various horizontal alignment systems, etc. guarantee useful applications under these conditions.

Jena Measurement - Internationally Proven Sport Measurement

For fast, reliable, and precise throw-distance measurements in the disciplines of the discus, hammer, and spear, including data transmission, the electro-optic tachymeters have been convincing at international sports events since 1977. A new development is the presentation of performance also for the disciplines of triple jump, broad jump, and pole vaulting, including call of the athlete, control of the small-field display and final determination of rank.

Instruments for Production Measurement Technology

"Effective production measurement technology by precision and productivity" - the following device complexes were devoted to this topic:

One , Two , and Three Coordinate Measurement Technology --
The exhibits included the universal length meters ULM 02-600 and ULM 01-600 C with a new length measuring system IDL 01 and the AE 100 display unit, the ABBE length measuring unit P 01, and the ABBE length measuring unit 01-200 C with the length measuring system IDL 01 and the AE 100 display unit, the large tool microscope DS with the Sony measuring system, the two-coordinate measuring units ZKM 02-250, ZKM 01-250 C with the length measuring system IDL 01 and an evaluation computer, ZKM 05-250 PC, and the three-coordinate measuring unit DKM 01-320 PC, both for connection to a freely programmable desk-top computer, as well as the laser measuring system LMS 100.

Measurement of Linearity and Planarity

Exhibits belonging to this complex are the precision linearity measuring unit GM 1200 with its evaluation computer and the electronic slant measuring unit with a digital display.

Technical Measurement Modules for Machine Tools and Devices

Here one should mention the incremental rotatory transducers IGR, and the further developed IGR M 2, the incremental length measuring system IDL 1, the incremental length measuring system with reflected light IAL, the recently developed scanning head 3D telemetric, the new display unit AE 80, and the new measurement-control device MS 4 with the control unit SG 112 (hall 20).

Length Measurement in the Work Shop and Measurement Room

This area comprises the following devices: drill steel adjusting unit, crankshaft testing unit, size testing station, manual measuring units - assortment, precision indicator with multi-place measuring device and computer connection (further development), incremental precision indicator IKF 30 with indicator units,

and the novel development IKF 100, as well as electronic-digital precision indicators with indicator units.

A clear performance increase could be detected in terms of newly developed measuring systems, and working productivity was further increased by modern evaluation technology.

Instruments for Optical Analysis in Measurement Technology

The leading idea here was "material economy by using measuring instruments for optical analysis, which belong to the new generation - precision and speed of material and structural analysis as essential presupposition for increasing productivity in research and industry." Three instrument complexes were presented under this heading:

The SPECORD Series of Instrument--
Among the double-beam spectrophotometers for structural analysis, the following are represented: SPECORD M 40 for the UV VIS spectral range with a complete assortment of user software cassettes and accessories, the newly developed SPECORD M 80 for the IR spectral range with software cassettes and accessories, and the likewise newly developed SPECORD M 85 especially for the MIR range with selected accessories.

The SPEKOL Series of Instruments--
From the series of single-beam spectrophotometers, the following were exhibited: the newly SPEKOL 11 with various measuring attachments as well as the instruments SPEKOL 211 and 221 which were presented for the first time in 1983.

Atom-Absorption Spectrophotometer --
The AAS 3 is being demonstrated with an electrothermal atomizer ETA, a newly developed mercury-hydride system, and a micropipetting device for trace analysis.

Besides these three complexes of instruments, the Combine Enterprise VEB Freiberg Precision Mechanics is demonstrating the new texture attachment TZ 6 to the horizontal diffraction goniometer HZG.

Microscopes

The new microscope generation JENA-MICROSCOPE 250-CF, represented by the microscope series JENAMED, JENAVAL, JENAPOL, and JANALUMAR, is completed by the newly developed series of reflected-like research microscopes JENAVERT. The variants comprise both a bright-field/dark-field variant as well as a large-field and standard-field variant. The proven EDUVAL and LABOVAL models supplement this program of exhibits, as well as the series of stereo microscopes, partially with special equipment for industry.

Further Product Areas

Among the export profile also belong:

Devices of optical medical technology with the further developed construction series of operation microscopes and with the new laser coagulator, microlithographic devices,

astronomical training and amateur telescopes with the newly developed TELEMATOR, planetariums (presented in model) with the newly developed large planetarium COSMORAMA, photographic and special lenses with the further developed small-picture lens PRACTICAR 1.4/50, binoculars, theater binoculars, aiming telescopes, eyeglasses, magnifying glasses, sextants, compasses, optical glass and household glass - likewise with interesting new and further developments.

Figure Captions:

Further developed standard lens PRAKTICAR 1:1.4 f = 50 mm MC for the Praktica B camera series.

Computer-connection control for incremental path sensors.

ABBE length measuring instrument 01-200 C.

3 D scanning equipment, telemetric.

Control unit SG 202 of the MS 4 measurement control with two EP6 measuring heads, in an application for measuring the thickness of rings.

AE 80 display unit.

The ABBE Length Measuring Instrument 01-200 C

The ABBE 01-200 C is a vertically measuring one-coordinate measuring unit with a motorized center-sleeve drive for direct length and difference measurements in production control and to monitor the gauge inventory. It is a further development of the ABBE D 01. Here, through the use of the high-precision incremental measurement system IDL 01 with the powerful display unit AE 100, measurement uncertainty is reduced, operating convenience is considerably improved, and economy has been increased.

The AE 100 makes possible, among other things, a linear error correction by the user. Through the circuit for detecting extremal values, it permits alignment of the measurement object and output of measured values at the BCD output onto peripheral units. The extensive accessories were retained.

Display Unit AE 80

An instrument for the digital display of linear displacements (mm, inches, increments) or turning angles (increments) in combination with incremental length measuring systems (IAL), or angle measuring systems (IGR, IGR-M2). Use of four independent display levels for counting or storing position values. Universal hardware solution with a microprocessor makes possible a great variety of software solutions.

AE 80-V with various preset switch-off values for applications in the machine tool industry.

AE 80-D to solve measurement problems.

The Incremental Precision Indicator IKF 100

The IKF 100 broadens the existing assortment of units for recording measurement data within the system of incremental precision indicators. It has a measurement range of 100 mm with a resolution of 1 μm and works with the existing display units AE 1I and AE 1IK. The measured data are obtained by photoelectrically scanning a glass-grid measurement scale. The measurement pins and the measurement scale have an anti-friction guideway. The mechanical connection is made at the 28 mm clamping shaft. Besides the conventional variant there is an attachment stage with a motorized measurement pin. The display units are equipped with a BCD data output according to SI 1,2 for connection to printers and computers. It is used in measurement rooms, process-near measurement stations, and in connection with positioning machines and equipment.

Length Measuring System IDL 01 With AE 100

The newly developed incremental length measuring system IDL 01 with the indicator unit AE 100 is used for the digital measurement of measurement paths with a resolution of 0.1 μm and a minimal measurement uncertainty. Special advantages are:

Non-contacting photoelectric scanning of a glass grid scale with a transmitted light method.

Reference mark permits reproducible absolute measurements.

Linear error correction with manual input through a preselection switch.

Nonlinear error correction through a microcomputer and PROM programming.

mm/inch switchover.

Measuring head dimension 40 x 45 x 54 mm^3.

Measurement head loss poser $\leq$ 0.1 W, consequently the measurement results are not impaired by thermal transient processes.

Incremental Rotary Transducer IGR-M 2

The IGR-M 2 is a photoelectric pulse generator in a miniature design. It permits the incremental measurement of rotation angles. With motion-converting elements, it can indirectly also measure linear displacements. The essential features of the new transducers compared to the previour IGR construction series are its low moment of inertia and its small construction size. The IGR-M 2 generates photo-electric analog signals corresponding to mechanical rotary motions and emits four approximately sinusoidal signal sequences for generating external counter pulses as well as two reference signals per revolution for generating reference pulses.

Computer Connection Control for Incremental Translational Path Sensor

The connection control makes possible a direct coupling of two incremental translational path sensors (maximum measurement path 100 mm, resolution 1 μm) from the VEB Precision Instrument Factory Suhl to microcomputer configurations which use the K 1520 as a basis.

The connection control is housed on a printed circuit board in the 215 mm x 170 mm format. On the computer side, it is fully compatible with the K 1520 system BUS. It can consequently be used in all automation systems, measurement stations, measurement instruments, etc., which use the K 1520 microcomputer.

3 D Scanning Device With Telemetric Signal Transmission

The 3 D scanning device from the VEB Precision Instruments Dresden, can solve a significant portion of the measurement and testing tasks resulting from operator-less production. Because of constantly increasing automation of production processes, these tasks are necessary in the production processes of the metal-processing industries.

The 3 D scanning device can be used as follows: before processing the work piece, after the completion of individual processing steps, for machine diagnosis and acceptance control by automatically scanning a measurement standard, for tool zeroing, as well as for detecting tool fractures and to measure tip mismatch.

MS 4 Measurement Control and SG 112 Control Unit

The MS 4 measurement control of the VEB Precision Instruments Dresden is built up from the digital measurement heads EP 6 and the two control units SG 202 and SG 203. On automatic measurement stations they can measure thicknesses at inside diameters in two planes of a roller bearing ring. The control units determine maximum and minimum values or maximum values of the two planes and their associated diameter difference. The measurement data are coded in BCD or are outputted as class signals. The SG 112 control unit supplements the proven SG 100 construction series with a type having additional electrical zero-point displacement.

Laser Coagulator

The stereo microscope that was especially developed for laser therapy can be used to treat both seated and lying-down patients.

Equipment characteristics are the following: the precise micromanipulator, the powerful argon laser, flexible light-guide transmission, remote laser operation, the motorized movable patient seat, the laser aperture shutter for the position with simultaneous fundus observation, and the electronic monitoring of all important functions.

Ophthalmological Work Station OAP 310/M

The OAP 310/M is the further developed device variant with the minus cylinder method (M). The two variants OAP 310/M and OAP 310/P are used to make routine working processes more efficient, especially in determining refraction by combining objective and subjective refractionation in practically one working step without the patient and the physician changing seats.

The instrument support 110, as the basic module of the OAP 310/M with the swivel-turntable and automatic detent for quick and safe instrument change of the slot light 110, the ophthalmometer 110, and the concidence refractometer 210. The OAP 310/M furthermore comprises the remote-operated visual character projector and the refraction system with the microprocessor control METROPHOR, consisting of the remotely operated phoropter, the concidence refractometer 210 with electrical output of measurement data, and the operating desk with digital display, as well as a printer and the peak lens-power meter 210.

SPECORD M 80 and SPECORD M 85

These instruments represent two new recording IR spectophotometers for the wave number range from 4,000 to 200 cm^{-1} or respectively 4,000 to 400 cm^{-1}. They satisfy both demanding research purposes and efficient analytical routines. The powerful double-beam principle with electric formation of quotients, the novel acquisition of measured values by a dark-stepping drive variant, and generous data storage characterize the design. A wide assortment of accessories for all important IR-specific measurement methods supplements this offering.

Figure Captions:

Recording IR Spectrophotometer SPECORD M 80

Reflected Light Microscope JENAVERT

Stereo Microscope GSM

Map Supplementation Unit KARTOFLEX

Spectrophotometer SPEKOL 11

As the successor instrument to more than 70,000 proven spectrophotometers SPEKOL and SPEKOL 10, the SPEKOL 11 is designed in microprocessor technology. While retaining all typical and proven use properties, its power, application range, and operating convenience were considerably increased. The instrument finds broad application in the health area, in agriculture and hydrology, pharmacy, biochemistry, industry, test agencies, as well as in research and educational institutions.

Mercury-Hydride System for the Atomic Absorptions Spectrophotometer AAS 3

This accessory system to the AAS 3 is used to analyze the hydride-forming elements As, Bi, Sb, Se, Sn and Te as well as Hg in the ng range, especially in the semiconductor industry, metallurgy, medicine, biology, hydrology, and environmental protection. By using modern microelectronics, a high degree of automation, operating convenience, and reliability are assured. The cell is electrically heated, and the heating unit operates under computer control. The inert gas flows are permanently set, the solution of reducing agent is transported pneumatically from the supply container into the reaction beaker. The cell temperature and the measurement running times can be selected freely. All data for the mercury hydride system are entered into the AAS 3.

Texture Supplement TZ 6 to the Universal X-ray Diffractometer HZG 4

By means of the texture supplement TZ 6, in combination with the universal x-ray diffractometer HZG 4, a powerful texture diffractometer was created for qualitative and quantitative texture analysis. The motion of the sample is controlled fully automatically by an electronic control component on a microcomputer basis. In this way, high operating convenience and a high degree of automation can be achieved in the texture measurement. Application areas are materials research and materials engineering in the areas of shaping and forming technology, electrical machine construction, corrosion research, plastic processing, etc.

Reflected Light Microscope JENAVERT

A reflected light microscope with vertical construction from the series of JENA MICROSCOPES 250-CF in the variants JENAVERT H, JENAVERT HD, JENAVERT GF-H. Use of newly developed CVD-free planachromats, HD-planachromats, and GF-planachromats/CF planachromats at the five-fold lens revolver. Built-in magnification changer, factors 0.8x, 1.0x, and 1.25x. Posssible overall magnification 12.5x to 2000x. Reflected-light bright field, reflected-light dark field. Efficient mode of operation through high operating convenience and ergonomically favorable design, integrated, regulated power supply for the lamps - 6V/25W. Copious accessories from the program of the JENA MICROSCOPES 250-CF.

Stereo Microscope GSM

The GSM is constructed according to the Greenough principle and works with a pair of coupled equivalent objective lenses. It is especially suited for the monitoring or production processes and for investigative and preparative work. Various design variants and copious supplementary equipment offer manifold combination and use possibilities. Magnifications of 8x and 32x with interchangeable optics between 5x and 125x.

1-m Mirror Telescope

While retaining the proven basic design - two optical systems (RC and Coude system), English mount - the essential modules such as the telescope drives, were redesigned and a modern control system with an integrated microcomputer from VILATI, Budapest, was used. Significant advantages are the following:

high accuracy, especially as regards positioning and tracking, by computer correction of error effects;

efficiency and operating convenience through automation of functions, e.g. photoelectric tracking correction, automatic dome tracking, automatic positioning, program control, comprehensive information for the observer through a video display, production of an observation record;

flexibility in adapting to new tasks by appropriate software and by the capability of connecting an external computer.

The instrument is the central unit of a modern astronomical observation system.

The Large-Scale Planetarium COSMORAMA

The new large-scale planetarium combines proven and further developed optical and mechanical systems with a powerful microelectronic control. The drive systems and the lamp brightness of the overall system is controlled on the basis of computer programs. Another feature is the universal display possibilities with a manageable number of operating elements. With the completely novel operating principle, various operating modes can be used, such as automatic program control, conversation-mode operation with the computer, corrections in stored programs, test programs, and manual operation. The instrument is designed for planetarium installations from 17.5 m to 25 m dome diameter.

PRAKTICAR 1:1.4f = 50 mm

A further developed standard lens with an especially large aperture for a 35 mm SLR camera of the Praktica B-series. Seven-element lens type in compact construction with low weight. Good imaging power already at full aperture. Usable for all task areas of a standard lens. Especially suitable for photographing theaters, stages, and circuses, for reporting under unfavorable light conditions, and for sports photographs with rapid motions. Can be used for scientific photography.

Automatic diaphragm, electrical transmission of aperture values, multiple coating (MC).

Optical Glass SF 11/1535

The colorless optical glass SF 11/1535 is being offered by the VEB JENA GLASS WORKS in an additionally improved transmission category. A decisive factor for the utility of this glass is its transmission in the short-wave region of the visible spectrum.

Optical glass type SF 11 with this improved quality is suitable for use in high-power lenses.

New Optical Semifinished Goods for Multi-Focal Eyeglass Lenses

As the result of extensive development, the VEB JENA GLASS WORKS is presenting four close-ups with high Abbe numbers and a further development of the traditional spectical crown glass K 13 in the form of a semifinished product as a long-distance part and supplementary part. The combination of close-range, long-distance, and supplementary part glasses yield fused raw parts for multi-strength glasses with a maximum strain birefringence of 70 nm/cm at the fusion boundary surface. The color-corrected multi-strength eyeglass lenses that are fabricated therefrom correspond to the international advanced level and will lead to a significant improvement of care with high-grade products for visual aid.

Distillation System for Corrosive Media

To distill corrosive media, a system made of technical glass is being presented. The media may contact only with the borosilicate glass 3.3 RASOTHERM, the sealing material PTFE, and the silicate glass with a high chemical and thermal resistance. The system consists of an electrically heated distillation column with storage vessels for the starting mixture and for the distillate. The protective pipes of a newly developed heater are made of silica glass. In the variant that is being exhibited, the reflex division is made by partial condensation over a defined water cooling unit in the flat-spiral cooler in the ascending part of the column.

Ultra-pure Materials From the LEW (Locomotive Construction and Electrotechnical Plant) Electro-beam Smelting Furnace

More and more industrial branches urgently require ultra-pure materials, such as can only be smelted in vacuum. A proven method is the smelting by electron beams.

In the GDR, a series of electron beam multi-chamber furnaces of the construction series EMO was developed and produced with powers of 60, 200, 250, and 1200 kW. This was done on the basis of basic research at the Institute Manfred of Ardenne/Dresden, by the Combine VEB Locomotive Construction and Electrotechnical Plant "Hans Beimler" Hennigsdorf.

LEW electron-beam systems are being used in the USSR, the CSSR, Poland, China, Rumania, India, Yugoslavia, and the GDR for research and for large-scale production.

Parts for the electron-beam systems - especially electron guns - are proving their worth, among other places, in the USA and Japan.

LEW, jointly with the Research Institute Manfred of Ardenne, is furnishing for export, for example, a powerful series of electron guns for manifold applications, with powers of 5, 15, 30, 60, 80, 250, 600, and 1200 kW.

High-Power Electron-Beam Furnaces

In the LEW electron-beam multi-chamber furnace, metals and their alloys, which have an appropriately low vapor pressure at their melting point, are smelted at a pressure of 1 Pa to 10^{-2} Pa. The wide pressure range permits, for example, the smelting of nickel, cobalt, and iron-based alloys, and also the smelting of reactive metals with high melting points, and their alloys, for example titanium, niobium, molybdenum, or tungsten.

During electron-beam smelting, the kinetic energy of accelerated electrons is used to heat the metal:

The energy of the electron beam heats the material being melted until it reaches the melting point, so that it drips into a water-cooled copper crystalizer, forms a smelting bath, and rigidifies.

The application of water-cooled copper crucibles makes possible melting without crucible reactions.

The smelting rate and the power fed into the process can be adjusted independently of one another.

The surface of the smelting bath as a reaction boundary layer can be heated very high by the electron beam. This results in good outgassing and slag removal rates.

It is possible to smelt reactive metals and metals with high melting points under very low pressure.

The application of information and power electronics makes possible high economy, efficient use of energy, more effective production, and higher quality of the final product.

LEW Electron-Beam Multi-Chamber Furnase EMO 60

This system has an electron-beam power of 60 kW and is intended for metallurgical investigations, for special smelts in experimental operations, and for smaller production tasks. The power of 60 kW already permits the smelting of all known metals and alloys. The smelting rate (smelted mass per unit time) can be varied within broad limits, so that metals with low melting points such as copper and steel can be smelted just as metals with very high melting points, such as molybdenum, tantalum, and tungsten.

The new EMO 60 systems, for example for the Indian Atomic Research Center, were equipped with electron guns having a power of 80 kW.

LEW Electron-Beam Multi-Chamber Furnace EMO 250

This furnace is a production system with 250 kW power. But it can certainly also be used economically for basic studies and for working out smelting technologies.

The EMO 250 system has already proven itself for years abroad and in the GDR. It is a further development of the EMO 200, which LEW produced and exported in large numbers. Building on the existing basic equipment, the furnace can be adapted in many variations by means of supplementary modules, corresponding to the required smelting technology.

LEW Electron-Beam Multi-Chamber Furnace EMO 1200

With its 1200 kW beam power, the EMO 1200 furnace is a production system for large smelting blocks. The principle of the electron multi-chamber furnaces EMO 60 and EMO 250 was retained: The electron beam is injected vertically into the smelting chamber from the top. Here, the electron gun is specially evacuated. With this system, too, the smelting operation can be maintained with a pressure of 1 Pa in the smelting space. This pressure lies significantly above the pressure in the beam generating space.

1200 kW electron-beam smelting systems that were built in 1965 are still working today in three-shift operation. With these systems, ingots up to 1,000 mm diameter and 18 tons weight can be smelted. The experience gained thereby was the basis for developing still larger systems. Systems for smelting steel blocks having a weight of 30 tons and 100 tons were implemented jointly by the GDR and various institutions of the USSR. These systems work with a fore-hearth. With the 30-ton system, 5 electron guns are used, and with the 100-ton system 7 electron guns are used, each with 1200 kW power, and of type EH 1200/50.

A Tape-Sputtering System Heated by Electron Beam

Systems for sputtering steel tape with aluminum likewise arose in collaboration with the Manfred of Ardenne Research Institute in Dresden. This method proved that coating rates in the range of 1,000 μm min^{-1} are possible with this technology. In this connection, highly productive run-through systems were produced, which are the basis for implementing other sputtering technologies, for example the sputtering of steel tape with copper or zinc. On the basis of corresponding development work, a license for the sputtering of steel tape with zinc could already be assigned to a Japanese enterprise.

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NC MACHINING CENTER FOR AXIALLY SYMMETRIC PARTS

East Berlin AGRARTECHNIK in German Vol 34 No 5, 1984 pp 203-204

[Article by Graduate Engineers K. Schultz, R. Paschen and H.-J. Rapp, Chamber of Technology VEB Agro-technical Industrial Plants, Nauen, Parent Enterprise of VEB Equipment Combine for Cattle and Hog Plants, Nauen]

[Text] 1. Introduction

In the field of automation technology, too, the rapid development of microelectronics has opened up new possibilities, which were fully utilized in the further development of machine tools. Numerically controlled machine tools are setting new standards, especially in the application to small- and medium-lot production, and, in connection with the use of industrial robots, lead to the removal of manpower from the direct work process and thus to a new quality of the manufacturing process.

Taking these findings into account and to realize the economic strategy decided by the 10th SED Party Congress with respect to the development of the national economy, the task was set at the end of 1980 by the director of the VEB Equipment Combine for Cattle and Hog Plants, Nauen (AKN) to analyze the possibility of the use of numerically controlled (NC) chucking lathes, which are then loaded by an industrial robot. This problem definition had the goal of fundamentally increasing the level of technology and thus securing a rapid increase in labor productivity as well as saving work time and work stations to a larger extent than up to now.

2. Preparation for Use

Proceeding from the problem definition, the following crucial points with regard to the preparation for use were dealt with:

--Analysis of the parts assortment
--Selection of the machines, as well as the peripheral technology, including clarification of the current account allocation, as well as the dates of delivery
--Location selection, integration into the production sequence, development of the plans for the installation of machinery, organization of the building license
--Qualification of the operating and maintenance personnel

--Clarification of all prerequisites for the introduction of the 3-shift system to guarantee the optimal degree of utilization of the equipment
--Provision of the proof of efficiency
--Singling out and dealing with application-specific problem definitions, e.g., multi-purpose gripper.

The analysis of the parts was undertaken within the framework of the VEB Equipment Combine for Cattle and Hog Plants, Nauen. In terms of emphasis, rotation-symmetric parts were tested. Specifically the following data were included:

--Diameter
--Length
--Lot size
--Lots per year
--Degree of complexity
--Type of processing
  rod part
  Tip part
  Chucking part.

The selection of the NC and robot technology was made on the basis of the provided analysis of the parts and with regard to the present supply. The following NC machines were selected:

-- 1 rod part lathe DSt 2/CNC 600
-- 2 tip part and chucking part lathes DS 2/CNC 600.

The manufacturer of both machine types is the VEB Large Lathe Building 8th May, Karl-Marx-Stadt. The industrial robot IR 2/S2-IRS 600 was obtained from the VEB Berlin Machine Tool Plant. In addition, the acquisition or production of work piece warehouses and other peripheral facilities, as well as accessories has taken place. A two-machine supply of the DS 2 through the IR 2 was viewed as a favorable variant. This was supposed to make a three-machine operation possible.

The qualification of the operating and maintenance personnel was taken into account already during the preparation for use. Specifically for maintenance all necessary training courses were selected from the qualification offers of the manufacturer, and suitable colleagues were sent to these training courses. In the training courses, the following priority problems were dealth with:

--IR 2 hydraulics
--Control IRS 600
--Mechanism DS 2/DST 2
--Control CNC 600
--Two-way converter.

In maintenance and repair the knowledge acquired in the training courses has had a positive effect. However, for technical problems with the control

system, the use of a cadre with a college or technical school education in this area of specialization or an experienced electronics engineer is recommended. The qualification of the operating personnel took place within the enterprise since there were no other possibilities. The instructors used were the 3 cadres with college/technical school education, whose work task was the erection of the technological unit (TE) and who also had acquired appropriate qualifications, e. g., with respect to programming. During the entire stage of the preparation of the problem definition and the preparation for use, all possibilities of the exchange of experience with other users were used intensively and successfully. Thus, on the one hand, important aspects of problems become visible in time and clearly through the exchange of experience, on the other hand, possibilities for follow-up use or cooperation are opened up. Specifically through the enterprises associated within the framework of the Development, Production and User Association Industrial Robots, valuable hints and also support were furnished.

Resulting from the parts assortment, special things were expected from the case of robot use in the VEB LIA, Nauen, which made possible only a limited use of model projects. To guarantee the effective work-load of the TE, it was necessary that both shaft and chuck parts could be processed with minimum retooling expenditure. This demand gave rise in particular to the following partial tasks, which had to be realized in the shortest possible time:

--Development and construction of a new gripper for the IR 2
--Change of the pressure device of the DS 2/CNC 600
--Change of the chuck part storage
--Change of the machine allocation DS 2-IR 2
--Change of the technological course of the supply and removal process.

Now it can be judged that, already during the stage of the preparation for use, exact schedule planning and control is of decisive significance and that only through the coordination of all partial tasks idle or waiting time can be avoided. The quality of the preparation for use has a direct effect on all subsequent processing stages and should be assessed accordingly.

3. Build-Up of Technological Uniformity

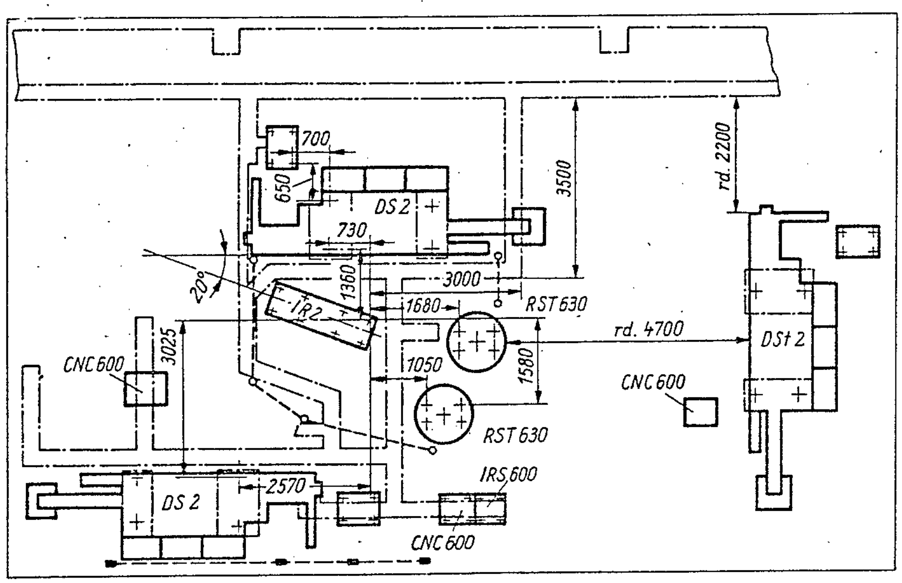
In the planning of the erection of the TE, the purely mechanical construction and the subsequent testing of the partial systems and the total system, above all, had to be coordinated. Users of NC and robot technology had recommended the separate construction and separate testing of IR 2 and NC lathes at the beginning of the testing stage.

In August 1982 the IR 2 was delivered and and erected for the test operation with the work piece storage.

In preparation for the installation of the NC lathes, the foundations and cable conduits were put in and the electric and compressed air connections were prepared in August 1982.

In September 1982 the delivery of the NC lathes took place. A DSt 2/CNC 600 and a DS 2/CNC 600 were delivered. For balance sheet reasons the delivery of the second DS 2/CNC 600 could not be realized until the beginning of 1984. A consequence of this was the fact that in the erection of the TE provisions had to be made for a second stage. In preparation for the initial operation, the two NC lathes were installed at the place of operation. The initial operation of the NC lathes, as well as the initial operation of the robot, were undertaken by the manufacturer. Here, too, timely schedule coordination guarantees the avoidance of more extensive waiting periods. In February 1983 the IR 2 was integrated in the TE. In so doing, the crucial thing was to align all components of the TE in accordance with the layout with nearly millimeter precision, since the IR 2 at that time was equipped with only one NC axis (Z-axis) and merely 3 positions could be started cam-controlled with the x-axis, i. e., the lathes and memories had to be located precisely on one flying circuit.

In order to meet this demand for precision, it has worked well to execute the IR 2 as a permanently-installed machine and subsequently allocate the memories.



Picture 1. Changed machine installation plan of technological uniformity; rotary switchboard RST 630

4. Testing

After having put into operation, the IR 2 was tested at a separate place in September 1982. Here, without impediment of the work on the NC technology, the necessary adjustment work on the robot could be undertaken and the experience in regard to the programming and operation could be gathered. The

experience in the area of programming was especially important since the handling of shaft and chuck parts and the planned supply of 2 NC lathes through the IR 2 did not allow a follow-up use of already established programs, e. g., from the research center of machine tool construction. After the initial operation, the testing phase of the NC lathes began in November 1982. This testing encompassed essentially the following partial tasks:

--Testing of previously developed work piece programs
--Development and testing of additional work piece programs
--Change of the manufacturing documents
--Instruction of the operating and maintenance personnel
--Achievement of all organizational demands necessary for integration into the manufacturing process (e. g., material preparation and allocation, appriate manufacture planning, etc.)

In February 1983 the IR 2 was transferred and allocated to the DS 2. Moreover the work piece storage were installed on a stationary basis. Subsequently the adjustment work between the IR 2 and the DS 2 and Between the IR 2 and the work piece storage was realized in order to make possible the necessary signal exchange. Finally the installation of the requisite safety technology devices took place. The testing of the entire TE begain in March 1983. In this testing phase the main emphasis was on the testing of the coordination of the partial systems of the TE. Moreover, the work mentioned in connection with the testing of the partial systems was continued.

Until May 1983 all work was realized during the normal shift. Subsequently the transition to the three-shift operation was gradually made. The three-shift utilization of the NC and robot technology was part of the last phase of the testing. Prior to the delivery of the TE to the division manufacturing in July 1983, experience was already supposed to be collected in regard to the three-shift operation in order to be able to draw necessary conclusions. The testing phase was structured generously in regard to the time available. Because of the failures of the NC lathes and the relatively long waiting periods for maintenance technicians, this measure proved to be advantageous, so that the TE could be delivered in accordance with the plan.

5. Attained State

During the testing phase and the use under production conditions, extensive experience was gained, which for the most part confirmed the experience of other users, but also led to the consideration of the special case of use from a new point of view.

During this indicated period the results achieved were assessed at continuous intervals. This included both efficiency studies and analyses of the downtimes.

The--in comparison to conventional technology--attained results can be summarized as follows:

--In general the economy of work time of 30 percent, which is given in the

literature, was achieved with the NC machines.

--In the case of complicated parts and especially screw threads significantly higher time savings were shown.

--The high process precision, e. g., in the case of fits, is to be assessed as especially advantageous and effective.

--Through the complex treatment of the parts on the NC machines a relief of other work techniques is achieved, e. g., in the sphere of blanks through the use of the rod part lathe. But also the work cycles drilling (shifting to the NC machines) and grinding (finish turning of the fits on NC machines) were perceptibly relieved.

The objective of attaining a machine running time of 15.5 hours per day required an immediate reaction to the knowledge gained through the analysis of the downtimes. Damages (failure of electronic, hydraulic or mechanical components) and shortcomings in work organization (missing tools, material, incorrect programs) were ascertained as the most important causes of downtimes. After the decline of the early failures, as well as through the further qualification of the maintenance personnel, a level adjustment of damage-caused downtimes to normal values could be attained.

In connection with the investigation of the downtimes, the question was repeatedly raised whether it is expedient to realize a two-machine supply by the IR 2, as planned.

The following aspects spoke against a two-machine supply:

--In the case of repair and maintenance work or retooling of an NC machine the supply of the second with the aid of the IR 2 is not possible because of reasons of safety technology.
--Through the overwhelming number of parts with low piece rates technologically-conditioned waiting periods occur since the IR 2 can only supply one machine at any given time.

On the basis of the experience gathered, the possible downtimes for the parts assortment to be processed were calculated and [it] was established that these can amount to up to 21.6 percent of the available machine time fund per NC machine.

An investigation of two-machine supplies realized with the aid of the IR 2 confirmed that, in the case of small- and medium-lot production, an efficient two-machine supply is possible only with a nearly unjustifiably high expenditure for safety technology. On the basis of these new findings, the proposal of the changed machine installation, made by the director of the VEB AKN Combine, was confirmed (Picture 1).

For the final expansion phase of the TE the following efficiency reference numbers were ascertained:

--Reflux duration	5.6 years
--Manpower release	9.6 full employment units
--Re-employed manpower (programmers)	3.0 full employment units
--Direct manpower release	6.6 full employment units

6. Summary

The introduction of NC and robot technology in the VEB LIA, Nauen, did not only signify the transition to qualitatively new manufacturing processes, characterized by the highest scientific-technological level, but it was also important to overcome ideological barriers and prejudices of the gainfully employed as well as management personnel. However, the productive efficiency and reliability of the new technology which has been clearly demonstrated in the course of its use thus far, was convincing. The active inclusion of all people to be involved in NC and robot technology in the future in the preparation for use and testing also played an important part in this.

8970
CSO: 2302/57

BRIEFS

GDR-USSR LASER RESEARCH COOPERATION--Discussions held by experts from the GDR and USSR in East Berlin ended on 27 April 1984. The talks focused on scientific cooperation in the areas of laser-induced nuclear fusion, quantum electronics and laser spectroscopy. The Soviet delegation was headed by Prof Dr Nikolay Bassov, director of the USSR Academy of Sciences Levedev Institute for Physics and holder of Lenin and Nobel prizes. Prof Dr Klaus Junge, director of the GDR Academy of Sciences Central Institute for Optics and Spectroscopy, headed the GDR delegation. Experts pointed to the development of high-power lasers for nuclear fusion, ultra short time [?pumped] lasers and their application, semiconductor injection lasers and cooperation in atomic absorption spectroscopy as outstanding results of the nearly 20 years of research cooperation. GDR participants in this cooperation have included study groups at the Friedrich Schiller University, Jena, and the Karl Marx Stadt Technical College, along with institutes of the GDR Academy of Sciences. The experts established objectives for their joint research up to 1985. They also discussed proposals for cooperation up until 1990 and signed appropriate documents. [Text] [East Berlin BAUERN ECHO in German 28-29 Apr 84 p 1]

CSO: 2302/47

PLANS FORMULATED FOR TRAINING IN BIOTECHNOLOGY

Budapest MAGYAR HIRLAP in Hungarian 14 Jun 84 p 4

[Summary] The national medium-term research and development program for biotechnology was approved in January 1984. A total of 140 million forints have been allocated to its implementation during 1984-1985. Lately significant development steps in this field have been taken at the Szeged Biological Center, the department of agro-chemistry of Budapest Technical University, several pharmaceutical factories as well as at some agricultural units. Although biotechnology in general requires lower investment outlays than other chemical industry projects, Hungary would still need to spend substantial sums at the outset, and these are limited by the current economic situation. However, training of specialists is feasible, and the shortage of expert training has become the Achilles heel of biotechnology.

Currently, 200 researchers participate actively in biotechnological work or have training they cannot utilize for lack of funds. Thus a group of specialist which could serve as a training core is available. Based on foreign experience, Hungary will probably need 20 graduate biotechnologists annually. Since speed is essential, the best approach is to give priority to postgraduate continuing education. Beginning in September, we will offer 11-month training courses to groups of 15-20 persons at existing laboratories. Competitions for the courses, which will be financially supported by the medium-term research and development plan, have already been published. Participants will be paid by their regular workplace, and the program will give each laboratory 200,000 forints per trainee of which 1,500 will be in dollars.

This type of training will make sense only during the initial phase of the program where speed is essential. Later it should be replaced by training such as a 2-year course in biological engineering at Budapest Technical University. The university could train about 10 specialists annually. The course could begin in September 1985. Additional training for 10-12 biotechnologists per year beginning also in September 1985 could be offered at the Jozsef Attila Scientific University, the Lorand Eotvos University of Science and the Agricultural University of Godollo as part of specialization in biology or agroengineering.

After work hour training is being considered at the institutes for continuing education in engineering and medicine.

Training for young specialists at home and abroad could be given under the auspices of the Science and Technology Committee. About five persons per year could participate in this form of training.

Under Hungarian conditions, it would be realistic to train 50-60 biotechnicians. The biological department of the Academy of Sciences and the Ministry of Culture are working on this project jointly. Initially, it would be wiser to aim for training basic rather than applied researchers.

CSO: 2502/65

NEW MICROCOMPUTER PRAISED FOR VALUE AND QUALITY

Purely Domestic Product

Budapest NEPSZABADSAG in Hungarian 16 May 84 p 4

[Excerpts] The Primo microcomputer is the size of a small typewriter but is capable of doing everything that a personal computer in this category can do. Its most attractive characteristic is its price: a total of 11,500 forints. (In the network of consignment stores, the available imported personal computers, or the domestic school computers which are technically equal to the Primo, cost between 40,000 and 60,000 forints.)

The Primo is made of only domestic and socialist microelectronic parts. Its heart, the microprocessor, is made in the GDR. Only the keyboard and the operation of the keys is a new development. The rest of the components can be purchased anywhere. So, for example, any domestically available television can be used as a monitor, and any tape recorder can be used as a memory.

By the time we had a look at the new machine, the Csolnok plant of the Sarisap Cooperative prepared a simple, yet up-to-date 800 square meter manufacturing facility. This year they plan to produce 3000 Primos there, with a rather small investment.

Production, Technical Details Outlined

Budapest MAGYAR HIRLAP in Hungarian 16 May 84 p 7

[Excerpts] The machine is manufactured by the experienced Uj Elet Cooperative of Sarisap. They initiated the planning of the MIKI 80 professional personal computer which was developed in half a year. They immediately sold 120 machines. This was a good start. They had done so well that they built a separate manufacturing facility in Csolnok, where they will produce the Primo exclusively.

They have already produced the first 50 pieces. This year they will produce 3000 more. Perhaps, even more will be produced, up to 6,000. There is only one requirement: there should be enough spare parts.

One or two facts: The Primo is based upon a single printed circuit board, using BASIC. Using the keyboard is easy, since it is pressure sensitive.

For this reason, among others, the machine is cheaper. It knows the Hungarian alphabet, can do graphics, and can be connected to any type of television and tape recorder found in our homes. It is marketed in three versions. A simple, low-capacity memory model costs 11,500 forints (this does not include the power supply). But the unit that has 64K of memory does not cost more than 20,000 forints.

Now we summarize the new facts: The Primo is truly competitive with the Spectrum and Commodore. As regards price and repair facilities and consumer service, it beats them. So a domestic product can beat the best foreign companies as regards price, size and quality.

CSO: 2502/63

ACADEMY PRIZE FOR FUSION OF PROTOPLASTS

Bedapest MAGYAR HIRLAP In Hungarian 31 May 84 p 8

[Interview with Lajos Ferenczy, doctor of biological sciences and chief of the microbiology faculty of the Attila Jozsef Science University, by Istvan Palugyai]

[Excerpt] At the general meeting of the hungarian Academy of Sciences this year Lajos Ferenczy was awarded the Academy Prize for realizing the transfer of properties between living organisms with the protoplast fusion of microscopic fungi.

[Question] What is this method in the development and perfection of which Hungarian researchers played a pioneering role and lead even today?

[Answer] To explain I must return to the beginnings. At that time we started from the antibiotic production of various microorganisms. We thought how good it would be to unite somehow strains with beneficial properties, thus to create more productive types. But we knew that there was no sexual reproduction between microscopic fungi producing these important pharmaceuticals. The transfer of properties takes place when two such cells come in proximity, their cell walls dissolve, and a union of the cell nuclei, representing a genetic restructuring, follows the uniting of cell membrane and plasma. But this phenomenon takes place so smoothly only between types occurring in nature. Usually the industrial microorganism strains, selected many times and cultured in the interest of one goal, are not capable of this. As a result of the constant selection the structure of their cell walls is changed, they do not dissolve, and so there is no fusion.

[Question] So the task was to remove the cell wall constituting the obstacle.

[Answer] This really was the basic idea. But in the 1950's already English and Czechoslovak researchers had succeeded in dissolving this cell wall from fungi cells with appropriate enzyme treatment. In this way they got cells, protoplasts, without a cell wall, covered only by a thin membrane, but preserving their functions. (This expression, protoplast, was used by cell researchers for the first time at the end of the last century to mean parts of the cells of higher order plants within the cell wall.) We began work in in the second half of the 1960's. By that time the biologists in Brno

had worked out how it a was possible to regenerate the cell wall which had disappeared. But they had not yet solved the most important thing, fusion. Our group produced various microscopic fungi mutants, and we tried to induce protoplasts obtained from various variant strains belonging to the same species to unite.

[Question] How?

[Answer] We forced the cells against one another with high pressure in a centrifuge and as a result of this a small part of them underwent fusion. We succeeded in proving this by the fact, on the one hand, that we found the cell nucleus of both partners in the new cells. On the other hand we used strains in the experiments which by themselves were incapable of developing colonies. However, united the development of colonies begins, which in itself is also proof of fusion. We reported on our results in the fall of 1972 at a conference in Spain and thus we were the first in the world to report the deliberately performed protoplast fushion of microbes. And since the prestigious professional journal NATURE published the discovery not much later no one has disputed our being first.

[Question] And did this make it possible to improve industrial microorganisms with the new method?

[Answer] Even the centrifuge method was suitable for this, but later we used a procedure which significantly increased the efficiency of fusion. This attaches to the names of Swedish and Canadian botanists--thanks to a chance discovery in the meantime in connection with experiments with the protoplasts of plants--but we were the first to use it for fusion of fungi. Here the pressure is replaced by polyethyleneglycol, which forces the cells without walls next to one another as a result of its dehydrating effect. This substance is already used for the fusion of animal and human cells also (cells without cell walls). In a succeeding step the protoplasts of cells belonging to different, closely related species were forced to unite also. Such a thing cannot be imagined in nature.

[Question] Except for gene cloning protoplast fusion is today the most promising biotechnological procedure for transfer of properties. And the name of Szeged has an illustrious ring in this area.

[Answer] That is true, for the first fusion of the protoplasts of bacteria took place here, also in the genetics institute of the Szeged Biological Center. Outstanding research is taking place here also in the third possible area for protoplasts, along the line of plant cell cultures, and here also our homeland can be found among the first in the world. Industry quickly noted the results of basic research, and protoplast fusion is already being put into the service of immediate biotechnological applications. At present the faculty is working on improvement, based on protoplast fusion, of six microorganisms which produce industrially important antibiotics and alkaloids. When some experiment becomes a routine task the activity is

taken over by the developmental section of some pharmaceutical factory. The basic procedures can be done in an average microbiology laboratory too, but the genetic and biological analysis of the fusion products requires many modern and expensive instruments and chemicals. For example, for the cell nucleus staining proving unification we use a material which costs 174,000 forints per gram, 300 times the price of gold.

[Question] In what directions is research proceeding?

[Answer] We have just registered--even abroad--with the Pharmaceutical Research Institute our joing patent, which pertains to three variants, separately producing the three materials, produced from a bacterium producing three types of antibiotic. This is more advantageous from the viewpoint of industry than the earlier types. Frequently we do not get viable cells in the protoplast fusion of related species because the enzymes of the cells influence the unification in a harmful way. For this reason another one of our projects led to a procedure in which only the isolated cell nucleus of one cell gets into the protoplast of the other. We were the first to report this also. Finally, as the experiment noted earlier shows also, we are working on fusion of more distant species and we are testing the limits of the method. Our first achievements with some luck gave us a head start; but today it is much more difficult to stay in the front rank.

[Question] How are the industrial connections of the faculty?

[Answer] Among the pharmaceutical factories they are especially outstanding with Biogal, Chinoin and the Kobanya Pharmaceutical Factory. We are also discussing giving an impetus to domestic citric acid production. Today, throughout the world, 90 percent of this substance, important to both the pharmaceutical industry and the foodstuffs industry, is produced by a mold fungus instead of by citrus types. In the USA alone, for example, they produce 200,000 tons per year. Using protoplast fusion we could produce better and more productive strains for the beer and baking industry or for viticulture. Today we get such yeasts largely from the West, but the very best method for improving them is protoplast fusion--as is done in the exporting countries. We would be helping domestic industry in this also.

The possibilities of protoplast fusion are virtually inexhaustible. Despite all this the research which began a little over ten years ago has taken only the first steps. Where it will go and what it will achieve are questions to which the answer will be given by the future, including the Hungarian biological schoool.

8984
CSO: 2502/58

NEW TECHNOLOGICAL DEVELOPMENTS DESCRIBED

Coal Carbonization Technology

Warsaw POLISH TECHNICAL REVIEW in English No 1, Jan 84 pp 3, 4

[Text]

The new coal carbonization technology developed at the Institute for the Chemical Processing of Coal in Zabrze (Polish Patent No. 102447) makes it possible to obtain coal tar capable of being hydrogenated with the simultaneous desulphurization of the carbonizate. The carbonization process is conducted at a temperature of below 580 °C in a fluidized-bed with external heat supply. Hot gas, which is not only the heat carrier but also a reagent in the decarbonization and desulphurization process, is used as the carrier medium. Pure hydrogen or a mixture of hydrogen with other gases may be used as carrier gas whose hydrogen content should exceed 5 per cent. Flue gases produced on burning coke-oven gas may be also used as carrier gas, the combustion process being in that case conducted in the presence of excess air. The hot hydrogen combines with free radicals and unsaturated bonds of compounds present in the tar, and prevents the polymerization of the volatile product and also the formation of higher molecular weight polymeric products that would otherwise be emitted together with the tar. As a result, the final tar product is fairly fluid. The preliminary hydrogenation of tar results in the hydrogen content of the tar product being increased up to at least 7.4 per cent. The hydrogen contained in the hot carrier gas reacts simultaneoulsy with the organic compounds of sulphur present in the carbonization product being formed, the hydrogen sulphide thus produced leaving the reaction system with the gases. The residual sulphur content of the carbonization product is by some 20···30 per cent lower than that required of fuels by relevant environmental protection standards. The post-carbonization carrier gas is cooled down, and the hydrogen sulphide washed out and further processed by conventional methods.

Uncooled Infrared Radiation Detectors

Warsaw POLISH TECHNICAL REVIEW in English No 1, Jan 84 pp 3, 4

[Text]

The Sylwester Kaliski Institute of Plasma Physics and Laser Microsynthesis, Warsaw, has developed, in cooperation with the Military Technical Academy, Warsaw, the FEM-type photon infrared radiation detectors outstanding for their high sensitivity and the fact that they do not require any cooling at all. The infrared radiation detectors manufactured so far either require cooling (up to −200°C using liquid nitrogen), or are of an uncooled design (pyroelectric detectors) and feature a very low sensitivity. The FEM detectors are designed for cooperation with CO_2 lasers for analyzing the laser radiation, e.g. for controlling laser welding and cutting operations, in microelectronics, and also in data transmission systems, etc.

The FEM detector's principle of operation involves the utilization of the photoelectromagnetic effect occurring in layers of cadmium – mercur telluride placed in a magnetic field. A FEM detector may be placed in a vacuum and does not require the application of a wide-band amplifier. Its other advantages are as follows: ambient temperature operation, an ultra-high response rate, wide dynamic range, possibility of direct recording on an oscilloscope (voltage signals of up to 100 V). The Institute of Plasma Physics and Laser Microsynthesis offers two models of the above detectors, namely the PO 05 and PO 25 versions.

Technical data: (corresponding values for the PO 05 and PO 25 versions) spectral range 8···12 μm, 3···5.5 μm, active area 1 × 1 mm, response time 0.2 ns, 5···10 ns, responsivity 1···10 mV/W, 0.2···5 V/W, detectivity $1 \cdots 10 \times 10^6$ cm Hz $^{1/2}$/W, size 38 × 19 × 30 mm.

Microcomputer For Psychological Research

Warsaw POLISH TECHNICAL REVIEW in English No 1, Jan 84 p 7

[Text]

The Institute of Electronic Technology of the Scientific and Production Centre for Semiconductors, Warsaw, has built a microcomputer, named CATTELLATOR, performing automatically all computations indispensable for interpreting results of psychological examinations carried out according to a test known as Cattelle's personality questionnaire. Without the use of a microcomputer, these calculations would take about two hours to perform. CATTELLATOR deals with them in a fraction of a second, the data input cycle lasting for about 15 minutes. This microcomputer is extremely simple to use.

The person being tested is handed a copy of a questionnaire comprising 305 questions, responses to which are either "yes", "no", or "don't know". An answer to a question whose particular number is displayed, involves the pressing of a suitable key. It is also possible to change one's answer to a preceding question. After answers to all questions have been given, the successive personality profile identifiers appear on the display screen together with their corresponding values of the so-called raw data. The CATTELLATOR unit is based on a single-circuit INTEL 8748 type microcomputer. It is equipped with a keyboard comprising 9 keys and an eight-position, seven-segment type display unit. The program executing the above test is stored in the EPROM store of the INTEL 8748 circuit. The program text occupies 697 bytes of address area from 0 to 2B9H, and arrays – 248 bytes from 300 to 3F3H.

Production Technology of Aluminum Powder

Warsaw POLISH ENGINEERING in English No 1, Jan 84 p 8

[Text]

The BIPROMET Design Office for the Non-Ferrous Metal Industry in Katowice has at its disposal production processes and documentation for a line manufacturing granulated aluminium powder. A plant built on the basis of the above technology is in operation since 1980 attaining excellent production results in excess of the design assumption.

The basic feature of the production process is the pulverisation of a stream of liquid aluminium in compressed air. The pulverized and solidified metal in the form of dust forms the final product.

Liquid aluminium from electrolysis or smelting furnaces is used as the charge for production. Maximum charge requirements amount to 1,045 kg per 1000 kg of powder.

The final product consists of aluminium powder obtained in fine fraction of a granulation from above 3 mm to below 0.15 mm. The share of individual fractions can be selected according to the requirements of users.

In the above production process liquid aluminium of a constant temperature, automatically controlled in an electrical resistance foundry furnace, is dosed by means of a trough to a crucible provided with 2—3 atomizers with cast iron nozzles. The latter are installed on a special shielding plate at the pulverising chamber. The jet of compressed air flowing through the nozzle exerts a strong suction action, strikes and penetrates the aluminium stream causing its pulverizing. When passing through the nozzle the air becomes heated to a temperature of approx. 200°C. The pulverizing stand is supplied with oil and humidity-free compressed air. Outflow from the nozzle is recorded by two TV cameras and displayed on monitors in the main control room. The above system has been applied to eliminate servicing staff at the pulverizing control station.

The pulverized metal solidifies and falls into the chute in the form of powder.

The motion of gases in the chamber takes place under the action of the velocity energy of cooling and pulverising air jets. The suitable arrangement of cooling air inlets (cold atmospheric air) and a special chamber shape cause the formation of a longitudinal circulation Vortex filling the entire chamber.

The pulverizing and aluminium powder carrying stream becomes directed into the cooling air vortices band.

Due to the multiple circulation of the gas stream the sedimentation of aluminium powder and its cooling takes place. As an additional powder cooling factor the diaphragm cooling of the lower chamber part walls takes place.
The supply and pulverizing air is carried away to the dust collecting station where the dust contained therein is removed.
The chamber vault has been made so that it forms the unstressing surface. In case of a possible explosion it becomes destroyed allowing the expanding gases to escape.

The cooled powder settling in the pulverizing chamber is continuously transported to the sorting room by means of a special conveyor system. All the sorting room equipment, i.e. the multi-deck vibration sifter, transfer stations, bag weighers, are all completely hermetic. The sorting station serves for dividing the powder into fractions according to user requirements. The sorted powder is loaded into bag weighers where packing into paper bags takes place. After sewing the bags are laid on conveyor belts and directed to the store.
Aluminium powder is widely applied in various industry branches and is very much sought after. It is inflammable and its suspension in air causes an explosion danger.

Dangerous concentrations may occur in the pulverizing chamber. In the construction of the chamber a range of protections is applied aiming at the reduction of the effect of possible explosion such as, for example, the protection of front chamber walls with reinforced concrete walls and the execution of the chamber vault as a stress relieving surface.

Dangerous conditions may also occur in pipelines, transfer stations, filter and sifter. All the above arrangements are equipped with special unstressing gates.
On account of the existing explosion danger a number of up-to-date solutions and protection has been applied in the aluminium powder plant reducing to the minimum the risk of explosion and its effects.
To the most important ones belong:
— full process automation and the use of closed circuit TV in regions endangered by explosion so as to reduce to a minimum the presence of servicing staff
— suitable construction of buildings
— maintaining of proper distance between the objects so as to mutually protect them
— adaptation of electrical systems to explosion danger conditions
— designing of a continuous automatic fire fighting system on the base of powder machine sets.

New Heterodyne Laser System

Warsaw POLISH ENGINEERING in English No 1, Jan 84 p 35

[Text]

At the Telecommunication and Acoustics Institute of the Wrocław Technical University, an original and very sensitive heterodyne laser system has been developed and tested, intended for measuring the concentration of electrons in plasma.

The measurement method consists in subjecting to heterodyne action the beams of two short single-mole lasers He-Ne 3.39 m one of which is provided with an internal cell with the plasma to be examined. The lasers are interconnected with an electronic back-feed loop, ensuring constant frequency differential $\Delta v = 1.5$ MHz between the frequencies generated by the individual lasers.

The periodic commutation of the discharge current of the plasma under examination with the F frequency produces modulation of the laser frequency with the plasma cell following the changes in the refraction index of the plasma.

The changes in the refraction index are measured by subjecting the signal of heterodyne action to synchronic detection past the frequency discriminator. The simulation tests have shown that the system makes it possible to measure the plasma parameters "concentration — length" $n_e l$ with a sensitivity $n_e l = 5 \times 10^{10}$ cm $^{-2}$ (l — length of reaction of beam with plasma, n_e — concentration of electrons).

The effected tests on low-pressure and low-temperature mercury plasma made it possible for a concentration of electrons to be measured from the level $n_e = 2 \times 10^{10}$ cm ^{3} up (for l equal to 2.5 cm).

This system has been constructed and tested at the Institute. The tests proved its sensitivity to be comparable to the best results obtained in other laboratories abroad, which use the methods of laser diagnostics of plasma.

CSO: 2020/96

ECOLOGICALLY THREATENED AREAS DESCRIBED

Warsaw WIADOMOSCI STATYSTYCZNE in Polish No 4, Apr 84 pp 29-32

[Article by Dr Jan Wojtan, Department of Information and Analysis, Main Office of Statistics: "Ecologically Threatened Areas in Poland (1)"]

[Text] Introduction

The dynamic development of industrialization and urbanization and the growth in population are causing irreversible changes in the natural environment. The increasing air, water and soil pollution has become a warning signal of the gradual degradation of this environment and have made it necessary to include the problem of environmental protection in the national program for socioeconomic development.

The threat to the natural environment grew greatly during the 1970's while the measures taken to protect it were not very effective. In many areas of the country the ecological resistance barrier in the natural environment was crossed. The development of transportation, the power and other industries, and the expansion of large urban centers brought negative effects, including devastation of the natural environment. Air pollution keeps increasing, ever-larger areas of inland waters and lakes are being contaminated, forests and farmlands are being destroyed, and the problem of managing municipal and industrial wastes is also arising.

In studying the threat to the environment, attention must be given primarily to:

--the heavy concentration of industry and large urban centers in a relatively small area,

--the nature of the economy, which in Poland is characterized by the large share of the mining and metallurgy, power, and chemical industries,

--the application, to a large degree, of obsolete technologies.

It appears, therefore, that the development of economic potential in the ecologically threatened areas should be linked with the application of modern production technologies as well as the installation of very efficient equipment to protect the natural environment against pollution. The most important

problem resulting from industrialization, urbanization and new management methods in agriculture is that of maintaining natural environmental conditions. The greater the surface area covered by urban concentrations and large industrial centers, which contaminate the air, water and soil around them, the greater the need for environmental protection of those areas. Protection of the plant and animal world, the soil, water and air against pollution is now the most important problem in the ecologically threatened areas in Poland.

This problem was reflected in Council of Ministers Resolution No 21/83 dated 4 March 1983 on the National Socioeconomic Plan (NPSG) for 1983-1985, in which the principles and instruments of territorial policy and environmental protection were defined.

--The principles of the policy on territorial development and environmental protection during 1983-1985 ensue from an analysis of basic social, economic, natural and systems-type determining factors, the more important of which are: the demographic situation, investment restrictions, and the situation in the field of natural environment protection.

--The goals of state policy in the area of territorial development during 1983-1985 are the following:

----improvement in the functioning of the already-established territorial structures, which have the highest degree of concentration of productive forces,

----a halt to the further regression of the natural environment.

To implement these goals, under existing circumstances, the following instruments were anticipated:

1. Exertion of influence through central investments and investments of the provincial offices, specified in the NPSG.

2. Twenty-seven areas (named in Annex No 4, Pt 4, to Council of Ministers Resolution No 21/83 dated 4 March 1983 on the National Socioeconomic Plan for 1983-1985) were designated ecologically threatened areas.

The areas are as follows:

1. Belchatow:
   --gminas: Kamiensk and Kleszczow.

2. Biale Zaglebie:
   --cities: Kielce and Checiny; gminas: Checiny, Daleszyce, Malogoszcz, Morawica, Piekoszow, Sitkowka-Nowiny and Sobkow.

3. Bydgoszcz-Torun:
   --cities: Bydgoszcz, Torun, Aleksandrow Kujawski, Ciechocinek, Solec Kujawski; gminas: Aleksandrow Kujawski, Biale Blota, Dabrowa Chelminska, Lubicz, Lysomice, Nowa Wies Wielka, Obrowo, Osielsko, Solec Kujawski, Wielka Nieszawka, Zlawies Wielka.

4. Chelm:
--cities: Chelm, Rejowiec Fabryczny; gminas: Chelm, Dorohusk, Lopiennik Gorny, Rejowiec, Rejowiec Fabryczny, Ruda Huta, Sawin, Sieliszcze, Wierzbica.

5. Czestochowa:
--cities: Czestochowa, Blachownia; gminas: Blachownia, Konopiska, Poczesna, Redziny.

6. Gdansk:
--cities: Gdansk, Braniewo, Elblag, Frombork, Gdynia, Hel, Jastarnia, Pruszcz Gdanski, Puck, Reda, Rumia, Sopot, Tolkmicko, Wejherowo, Wladyslawowo; gminas: Braniewo, Cedry Wielkie, Elblag, Frombork, Kolbudy Gorne, Kosakowo, Krokowa, Milejewo, Pruszcz Gdanski, Puck, Stegna, Sztutowo, Tolkmicko, Wejherowo, Zukowo.

7. Gorny Slask [Upper Silesia]:
--cities: Katowice, Bedzin, Brzeszcze, Bukowno, Bytom, Chelmek, Chorzow, Chrzanow, Czechowice-Dziedzice, Czeladz, Dabrowa Gornicza, Gliwice, Jaworzno, Libiaz, Laziska Gorne, Mikolow, Myslowice, Olkusz, Orzesze, Oswiecim [Auschwitz], Piekarsy Slaskie, Pyskowice, Ruda Slaska, Siemianowice Slaskie, Sosnowiec, Swietochlowice, Tarnowskie Gory, Trzebinia, Tychy, Zabrze; gminas: Babice, Bobrowniki, Brzeszcze, Bukowno, Chelmek, Chrzanow, Klucze, Libiaz, Miedzna, Olkusz, Oswiecim, Psary, Swierklaniec, Trzebinia, Zbroslawice.

8. Inowroclaw:
--cities: Inowroclaw, Barcin, Janikowo, Kruszwica, Pakosc; gminas: Barcin, Inowroclaw, Janikowo, Kruszwica, Pakosc.

9. Jelenia Gora:
--cities: Jelenia Gora, Karpacz, Kowary, Piechowice, Szklarska Poreba; gminas: Janowice Wielkie, Myslakowice, Podgorzyn.

10. Konin:
--cities: Konin, Kleczew, Slesin. Turek; gminas: Brudzew, Kazimierz Biskupi, Kleczew, Kramsk, Przykona, Slesin, Turek, Wladyslawow.

11. Krakow:
--cities: Krakow, Krzezzowice, Niepolomice, Proszowice, Skawina, Slomniki, Wieliczka; gminas: Alwernia, Biskupice, Czernichow, Drzwiania, Igolomia-Wawrzenczyce, Iwanowice, Jerzmanowice-Przeginia, Klaj, Kocmyrzow-Luborzyca, Koniusz, Krzeszowice, Liszki, Michalowice, Mogilany, Niepolomice, Nowe Brzesko, Proszowice, Radziemice, Skala, Skawina, Slomniki, Suloszowa, Swiatniki Gorne, Wieliczka, Wielka Wies, Zabierzow, Zielonki.

12. Legnica-Glogow:
--cities: Legnica, Glogow, Boleslawiec, Chocianow, Chojnow, Jawor, Lubin, Polkowice, Prochowice, Przemkow, Scinawa, Zlotoryja; gminas: Boleslawiec, Chocianow, Cojnow, Gaworzyce, Glogow, Grebocice, Gromadka, Jarzmanowa, Kotla, Krotoszyce, Kunice, Legnickie Pole, Lubin, Mecinka, Milkowice,

Msciwojow, Peclaw, Polkowice, Prochowice, Przemkow, Radwanice, Rudna, Ruja, Scinawa, Warta Boleslawiecka, Wadroze Wielke, Zagrodno, Zlotoryja, Zukowice.

13. Lodz:
-- cities: Lodz, Aleksandrow Lodzki, Konstantynow Lodzki, Pabianice, Zgierz; gminas: Aleksandrow Lodzki, Pabianice, Rzgow, Zgierz.

14. Myszkow-Zawiercie:
--cities: Myszkow, Zawiercie, Ogrodzieniec, Poreba.

15. Opole:
--cities: Opole, Gogolin, Kedzierzyn-Kozle, Krapkowice, Kuznia Raciborska, Lesnica, Strzelce Opolskie, Zdzieszowice; gminas: Bierawa, Gogolin, Krapkowice, Lesnia, Strzelce Opolskie, Tarnow Opolski, Zdzieszowice.

16. Plock:
--cities: Plock; gminas: Borowiczki, Stara Biala.

17. Poznan:
--cities: Poznan, Lubon, Mosina, Puszczykowo, Steszew, Swaredz; gminas: Czerwonak, Komorniki, Mosina, Steszew, Suchy Las, Swaredz.

18. Pulawy:
--cities: Pulawy, Kazimierz Dolny, Naleczow, Konskowola; gminas: Baranow, Janowiec, Kazimierz Dolny, Konskowola, Pulawy, Wawolnica, Zyrzyn.

19. Rybnik:
--cities: Rybnik, Jastrzebie-Zdroj, Knurow, Leszczyny, Wodzislaw Slaski, Zory; gminas: Gaszowice, Gieraltowice, Godow, Gorzyce, Leszczyny, Lubomia, Lyski, Mszana, Pawlowice, Swierklany, Zebrzydowice.

20. Szczecin:
--cities: Szczecin, Goleniow, Gryfino, Kamien Pomorski, Nowe Warpno, Police, Stargard Szczecinski, Swinoujscie, Wolin; gminas: Dobra Szczecinska, Dziwnow, Goleniow, Gryfino, Kamien Pomorski, Kobylanka, Kolbaskowo, Nowe Warpno, Police, Stare Czarnowo, Stargard Szczecinski, Stepnica, Wolin.

21. Tarnobrzeg:
--cities: Tarnobrzeg, Baranow, Sandomierski, Mielec, Nisko, Nowa Deba, Polaniec, Stalowa Wola, Staszow; gminas: Baranow, Sandomierski, Bojanow, Borowa, Czermin, Grebow, Jarocin, Koprzywnica, Loniow, Lubnice, Majdan Krolewski, Mielec, Nowa Deba, Osiek, Padew Narodowa, Polaniec, Pysznica, Rytwiany, Staszow, Tuszow Narodowy.

22. Tarnow:
--cities: Tarnow, Debica, Pilzno, Zabno; gminas: Czarna, Debica, Lisia Gora, Pilzno, Radlow, Skrzyszow, Tarnow, Wierzchoslawice, Zyrakow.

23. Tomaszow:
--cities: Tomaszow Mazowiecki; gminas: Inowlodz, Lubochnia, Tomaszow Mazowiecki.

24. Turoszow:
--cities: Zgorzelec, Bogatynia, Piensk, Zawidow; gminas: Bogatynia, Piensk, Sulikow, Zgorzelec.

25. Walbrzych:
--cities: Walbrzych, Boguszow-Gorce, Gluszyca, Jedlina-Zdroj, Nowa Ruda, Szczawno-Zdroj, Swiebodzice; gminas: Gluszyca, Nowa Ruda, Walim.

26. Wloclawek:
--cities: Wloclawek, Brzesc Kujawski; gminas: Bobrowniki, Brzesc Kujawski, Fabianki, Wloclawek.

27. Wroclaw:
--cities: Wroclaw, Brzeg Dolny, Oborniki Slaskie, Olawa; gminas: Brzeg Dolny, Oborniki Slaskie, Olawa, Swieta Katarzyna.

Special principles applying to development in these areas were established, and in particular:

--a ban on construction and expansion of factories which would be harmful to the environment,

--development of comprehensive programs for halting the degradation of the environment and for gradually improving it in the Gorny Slask [Upper Silesia], Rybnik, Krakow and Gdansk ecologically threatened areas.

The protection of man's natural environment has become one of the most important problems today and requires a multiplicity of practical actions and comprehensive scientific study.

Recognizing the importance of this problem in Poland, work was undertaken in the Main Office of Statistics on a statistical description of the ecologically threatened areas. The results were presented in a publication titled "Ecologically Threatened Areas in Poland" (Main Office of Statistics, Warsaw, January 1984).

Surface and Population

The ecologically threatened areas in Poland cover a surface of 35,200 square kilometers, which constitutes 11.3 percent of the country's total surface. These areas vary greatly from the standpoint of size. The largest threatened area, Legnica-Glogow, is almost 20 times larger than the smallest, Myszkow-Zawiercie. In addition to Legnica-Glogow, other large areas are: Szczecin, Gdansk and Gorny Slask. It should be said that Gorny Slask, Rybnik, and Krakow form a continuous ecologically threatened area covering 2.1 percent of the country's surface (6,532 square kilometers). In addition to Myszkow-Zawiercie, the smallest surface areas are Belchatow and Plock.

It is obvious that the ecologically threatened areas are, to a large degree, linked with the industrial districts and urban centers. Therefore, most of the ecologically threatened areas are in the southern and southwestern parts of the country.

Considering the territory occupied by the particular areas and the numbers of people living permanently in these areas, they can be divided into four groups;

A - areas which occupy a small surface and have a large population (Lodz, Wroclaw, Poznan and Rybnik),

B - areas which occupy a large surface and have a large population (Gorny Slask, Gdansk, Krakow, Szczecin, Bydgoszcz-Torun and Legnica-Glogow),

C - areas which occupy a small surface and have a small population (Opole, Czestochowa, Biale Zaglebie, Tarnow, Walbrzych, Konin, Jelenia Gora, Wloclawek, Inowroclaw, Plock, Pulawy, Myszkow-Zawiercie, Tomaszow, Turoszow and Belchatow),

D - areas which occupy a large surface and have a small population (Chelm and Tarnobrzeg).

The share of particular ecologically threatened areas in the surface and population in 1982 was as follows:

Groups:	A	surface:	1.2 percent, population:	8.3 percent
	B		5.8	19.1
	C		3.0	6.8
	D		1.3	1.3

On 31 December 1982, 12.909 million people lived in ecologically threatened areas, which is 35.5 percent of the country's total population. The highest population concentration was in the Gorny Slask area (2,935,100) and the lowest was in Belchatow (11,200). Of a total number of cities (805) and gminas (2,110) in the country, the ecologically threatened areas encompassed 161 cities and 231 gminas. However, this includes primarily the large and average-size cities. For example, of the 38 cities in Poland numbering over 100,000 inhabitants, at present only 9, i.e., Warsaw, Bialystok, Gorzow Wielkopolski, Lublin, Olsztyn, Radom, Rzeszow and Zielona Gora, are not in these areas. Thus there are 11.001 million people living in the cities in the ecologically threatened areas, and 1.908 million people live in the countryside in these areas. The population living in these cities constitutes 30.2 percent of the country's total population (the national average is 59.5 percent), while the population living in the countryside makes up 5.3 percent (the national average is 40.5 percent). Thus these are areas which have a high concentration of city population.

The Belchatow and Rybnik areas have a shortage of women. In the Belchatow area there are 96.1 females to 100 males, and in the Rybnik area, 98.9. The feminization index is high in the following areas: Lodz, Poznan and Bydgoszcz-Torun, where per 100 males there are, respectively, 116.2, 111.8 and 111.5 females. The areas which are not ecologically threatened have more women in the cities and fewer women in the countryside.

The areas examined have a very wide range of population density. In 1982 in the Lodz area the population density amounted to 1,270 persons per square kilometer, while in the Belchatow area there were 50.8 persons per square kilometer. There is a high population density (over 500 persons per square kilometer) in the following areas also (in addition of Lodz): Gorny Slask, Wroclaw, Poznan, Rybnik and Walbrzych, but a low density (less than 150 persons per square kilometer) in the Chelm, Legnica-Gloglow, Tarnobrzeg and Pulawy areas.

The ecologically threatened areas have a population density per square kilometer three times that of the national average and four times that of the remaining areas. Table 1 shows the population density in the areas discussed in 1982 as compared with the country and the remaining areas.

Table 1. Population Density

Item	Total	Ecologically Threatened Areas	Remaining Areas
	Population per Square Kilometer		
Poland	116.4	366.5	84.7
Cities	1,096.5	1,326.4	930.1
Countryside	50.3	70.9	48.3

The population living in ecologically threatened areas during 1978-1982 increased by 573,200. Taking into account their small surface, this attests to a further intensive concentration of population in these areas. During this period the population grew both in the cities and in the countryside, yet in the remaining areas the population in the cities increased but decreased in the countryside. The change in population during 1978-1982 is shown by the following figures (Table 2).

Table 2. Population Increase (Loss) During 1978-1982

Item	Total	Ecologically Threatened Areas	Remaining Areas
	In Thousands		
Poland	+1,235.2	+573.2	+662.0
Cities	+1,283.5	+565.2	+718.3
Countryside	-48.3	+8.0	-56.3

The greatest population increase was recorded in the Gorny Slask area, where during 1978-1982 the population increased by 181,800. There were also large population growths in the following areas: Rybnik (37,200), Gdansk (33,400), Legnica-Gloglow (29,400), Szczecin (28,400), Bydgoszcz-Torun (27,700), Wroclaw (26,600) and Poznan (25,600). Only the Belchatow area had a population drop (300).

The increase in population in the ecologically threatened areas caused an increase in population density. The highest increase in population density was noted in the Gorny Slask area (58 persons per square kilometer), and then in the Plock area (36.2), Rybnik (35.8), Czestochowa (29.9), Lodz (29.8) and Wroclaw (29.5 persons per square kilometer). The lowest increase in population density among those studied occurred in Turoszow, Tomaszow, Pulawy and Chelm. In the Belchatow area the population density dropped by 1.4 persons per square kilometer. The remaining areas had a higher increase in population density in the cities and a lower increase in the countryside, as compared with the ecologically threatened areas.

A particularly high population density in the countryside was recorded in 1982 in the following areas: Rybnik, Gorny Slask, Czestochowa, Krakow and Tarnow. In the Gaszowice and Swierklany gminas (Rybnik area) the population density exceeds 400 persons per square kilometer, and in the Swiatniki Gorne gmina (Krakow area) it is 350 persons per square kilometers. However, in these areas also, there are gminas with a very low population density, not exceeding 10 persons per square kilometer. These gminas are Nowe Warpno in the Szczecin area and Solec Kujawski in Bydgoszcz-Torun.

A large concentration of population is noted in some cities where the environment is especially threatened, namely in: Glogow and Lubin (Legnica-Glogow area), Chorzow, Swietochlowice and Siemianowice Slaskie (Gorny Slask area), Lodz and Aleksandrow Lodzki (Lodz area) and in Elblag (Gdansk area). In these cities population density exceeds 3,000 persons per square kilometer. It should be said that among these towns there are also some which have a very low population density, e.g., Nowe Warpno, with 50.8 persons per square kilometer, Szklarska Poreba, 104.1, Piechowice, 112.1, Kazimierz Kolny, 136.1, and Karpacz, 137 persons per square kilometer.

The natural movement of the population in the ecologically threatened areas differs greatly from that of the remaining areas.

These differences are seen in the lower birth rate per 1,000 population in the ecologically threatened areas, a lower death rate, and at the same time a lower rate of natural growth.

In the city-countryside breakdown the components of the natural population movement in the ecologically threatened areas and the remaining areas are very different. The cities located in the areas studied have a lower rate of live births, a lower death rate and a lower rate of natural growth, in comparison with the cities located in the remaining areas. In the gminas the situation is reversed: the ecologically threatened areas have higher (per 1,000 population) live birth rates, death rates and natural growth rates, than the other countryside areas.

In the particular ecologically threatened areas large differences occur from this standpoint. The Tarnobrzeg, Rybnik and Legnica-Glogow areas have a high live birth rate, a low death rate and, as a consequence, a high natural growth rate, while the Lodz, Krakow, Poznan and Myszkow-Zawiercie areas have a low live birth rate, a high death rate and, as a result, a low natural growth rate.

In the particular cities or gminas even greater extremes appear. For example, the cities of Debica, Mielec, Pakosc, Reda and Zdzieszowice and the gminas Lysomice, Milejowo, Pakosc, Piekoszow and Wejherowo have a high live birth rate, and low death rate and a high natural growth rate among the cities and gminas studied, while the cities of Brzesc Kujawski, Kazimierz Kolny, Kleczew, Lodz and Prochowice, and the gminas Bobrowniki, Iwanowice, Lopiennik Gorny and Radziemice, have a low live birth rate, high death rate and, as a result a very low natural growth rate.

As compared with 1978, the highest, among the areas studied, drop in live births, and at the same time, minimal, it is true, increase in deaths occurred in the Plock ecologically threatened area, which meant that the Plock area had the highest drop in natural growth. A similar circumstance was noted also in the Wroclaw area. During this period the greatest tendency for population growth as a result of natural growth was recorded in the Belchatow and Inowroclaw areas.

The migration of population in the ecologically threatened areas indicates a widely varying pattern.

The following areas deserve attention in this respect:

1. Areas in which a high migration growth rate per 1,000 population is recorded -- Myszkow-Zawiercie and Rybnik.

2. Areas in which a large migration loss (per 1,000 population) occurred -- Belchatow and Walbrzych.

3. Areas in which a high number of registrations for permanent residence and departures from permanent residence were recorded, while migration totals remained at a constant average -- Wroclaw, Lodz and Legnica-Glogow.

4. Areas in which a much lower than average rate of registrations for permanent residence and departures from permanent residence were recorded, while migration totals remained at a constant average -- Czestochowa, Poznan and Plock.

In 1982 a minus migration balance was recorded in seven ecologically threatened areas (Belchatow, Chelm, Jelenia Gora, Pulawy, Szczecin, Turoszow and Walbrzych) while in 1978 a minus migration balance was recorded in five areas (Belchatow, Czestochowa, Jelenia Gora, Turoszow and Walbrzych). In the years mentioned above the highest minus migration balance per 1,000 population was recorded in the Belchatow area: 1978, -19.1, and in 1982, -23.2.

Table 3. Surface and Population in Ecologically Threatened Areas in 1982.

(1) Wyszczególnienie	(2) Powierzchnia w km^2	(3) Ludność (4) w tysiącach	(3) Ludność (5) w %	(6) Kobiety na 100 mężczyzn	(7) Ludność na 1 km^2
(8) **Polska**	312683	36398,6	*100,00*	105,2	116,4
(9) miasta	19749	21655,3	*59,49*	108,1	1096,5
(10) wieś	292934	14743,3	*40,51*	101,1	50,3
(11) Obszary ekologicznego zagrożenia razem	35220	12909,0	*35,46*	105,7	366,5
miasta	8294	11001,0	*30,22*	106,4	1326,4
wieś	26926	1908,0	*5,24*	101,6	70,9
(12) Bełchatowski	221	11,2	*0,03*	96,1	50,8
(13) Białe Zagłębie	1032	267,0	*0,73*	107,5	258,7
(14) Bydgosko-toruński	1907	647,3	*1,78*	111,5	339,4
(15) Chełmski	1455	128,8	*0,35*	106,8	88,5
(16) Częstochowski	406	284,5	*0,78*	108,8	700,1
(17) Gdański	3219	1133,7	*3,11*	104,2	352,2
(18) Górnośląski	3134	2935,1	*8,06*	100,5	936,5
(19) Inowrocławski	763	137,6	*0,38*	107,6	180,2
(20) Jeleniogórski	532	142,8	*0,39*	109,6	268,3
(21) Koniński	1012	158,9	*0,44*	104,7	156,9
(22) Krakowski	2360	1073,4	*2,95*	100,6	454,7
(23) Legnicko-głogowski	4032	508,5	*1,40*	101,2	126,1
(24) Łódzki	825	1047,8	*2,88*	116,2	1270,0
(25) Myszkowsko-zawierciański	204	95,9	*0,26*	107,9	470,1
(26) Opolski	1005	314,1	*0,86*	106,6	312,6
(27) Płocki	252	123,0	*0,34*	105,1	487,8
(28) Poznański	998	682,1	*1,87*	111,8	683,9
(29) Puławski	742	100,4	*0,28*	107,9	135,3
(30) Rybnicki	1038	591,9	*1,63*	98,9	570,2
(31) Szczeciński	3483	653,1	*1,79*	102,5	187,6
(32) Tarnobrzeski	2551	337,3	*0,93*	100,3	132,2
(33) Tarnowski	1113	263,2	*0,72*	107,1	236,5
(34) Tomaszowski	416	86,4	*0,24*	109,8	207,6
(35) Turoszowski	500	86,0	*0,24*	103,8	172,1
(36) Wałbrzyski	492	247,0	*0,68*	108,0	501,8
(37) Włocławski	627	140,5	*0,39*	108,0	224,1
(38) Wrocławski	901	711,5	*1,95*	109,0	789,8
(39) Pozostałe tereny razem	277463	23489,6	*64,54*	104,9	84,7
(9) miasta	11455	10654,3	*29,27*	109,8	930,1
(10) wieś	266008	12835,3	*35,27*	101,0	48,3

Key:

1. Item
2. Surface in sq km
3. Population
4. In thousands
5. In percent
6. Females per 100 males
7. Population per 1 sq km
8. Poland
9. Cities
10. Countryside
11. Total ecologically threatened areas
12. Belchatow
13. Biale Zaglebie
14. Bydgoszcz-Torun
15. Chelm
16. Czestochowa
17. Gdansk
18. Gorny Slask
19. Inowroclaw
20. Jelenia Gora
21. Konin
22. Krakow
23. Legnica-Glogow
24. Lodz
25. Myszkow-Zawiercie
26. Opole
27. Plock
28. Poznan
29. Pulawy
30. Rybnik
31. Szczecin
32. Tarnobrzeg
33. Tarnow
34. Tomaszow
35. Turoszow
36. Walbrzych
37. Wloclawek
38. Wroclaw
39. Total remaining areas

Thus also the strength of constant migration to ecologically threatened areas is diminishing, and even an increase in the number of areas with a minus constant migration balance is being observed, while its strength is also growing.

Looking at the total picture of migration in the cities and gminas we see a tremendous difference in the strengths of the migration movements. Among the cities, Rumia, Zory, Zdzieszowice and Laziska Gorne had a particularly large plus balance of migration per 1,000 population in 1982, while Szczawno-Zdroj, Pyskowice and Boguszow Gorce had a particularly large minus balance. Among the gminas a high plus migration balance was noted in Pawlowice and Kolbaskowo, while a high minus balance was recorded in Jerzmanowo, Glogow and Kotla.

Real growth in the ecologically threatened areas differs greatly. For example, in the Rybnik area the real growth was +21.9 persons per 1,000 population, while in the Belchatow area it was -13.2. It should be stated that only the Belchatow area has a minus real growth. Aside from this, a very low real growth per 1,000 population was recorded in the Walbrzych and Lodz areas.

Among the particular cities the differences in real growth rate per 1,000 population range from -24.3 in Szczawno-Zdroj to +77.2 in Rumia. Among the gminas the range of differences is somewhat smaller and varies from -24.9 in Kotla to +37.2 in Kolbaskowo.

During 1978-1982 a shrinking trend of real growth in the ecologically threatened areas was observed, however in the remaining areas during the period in question a growing trend of real growth was noted per 1,000 population.

The shrinking trend of real growth per 1,000 population in the ecologically threatened areas may in the future have an unfavorable effect on the size of the labor force, and thus on the future economic development of these areas.

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COMPUTER-ASSISTED SCIENTIFIC RESEARCH, DESIGN

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/Article by Doru Musat: "Computer-Aided Scientific Research and Technological Design"/

/Text/ In the current stage, that of a transition by Romania to a new stage of development, according to the basic strategic objective set by the 12th congress and the national conference of the party, the amplification of the products' and processes' characteristics of quality, of efficiency and labor productivity, of profitability and competitiveness, on the basis of utilizing the most important gains of science and technology, lies in the center of the concerns of all our working people.

In the regard, as Comrade Nicolae Ceausescu has stressed repeatedly, the activity of scientific research, technological development, and introduction of technical progress, performed under conditions of maximum efficiency and at a rapid rate, specific to the current scientific and technical revolution, constitutes an essential factor for promoting economic and social progress.

As a result of the persevering policy of wide revolutionary spirit promoted by the party, a vast network of scientific research and technological engineering units has been created in our country, they representing an optimum organizational framework for materializing the remarkable potential of the Romanian researchers for creation. The activity of the scientific research and technological development units is unfolding on the basis of the provisions contained in the scientific research and technological development program for 1981-1990, supplemented by the main directions up to the year 2000. A number of directions regarded, naturally, as priorities are stressed in the program: the development of the base of raw materials and energy, the reduction of the technological consumptions of raw materials and energy, the harnessing of alternative sources of energy, the modernization of the manufacturing technologies, including through the expansion of automation and robotization, and the raising of the qualitative level of products. These directions are detailed and concretized in the two priority programs, drawn up on the initiative and under the direct guidance of Comrade Nicolae Ceausescu and approved by the plenum of the RCP Central Committee in November 1983--the Program Regarding the More Marked Growth of Labor Productivity and the Improvement of Labor-Norm Setting in the 1983-1985 Period and up to 1990 and the Program Regarding the Improvement of

the Technical and Qualitative Level of Products, the Reduction of the Consumption of Raw Materials, Fuel and Energy and the Better Utilization of Raw Materials and Supplies in the 1983-1985 Period and up to 1990.

Starting from the orientations and tasks set by the party documents, the Central Institute for Machine Tools, Electrical Engineering and Electronics has turned to a very efficient method to tackle the problems that it has to solve--namely, the intensive and extensive utilization of computer technology in the activity of research and development, with the Computer Center of the Scientific Research and Technological Engineering Institute for the Electrical Engineering Industry (ICPE) having to become a model unit both from the viewpoint of equipment and organization and especially from that of the problems taken under study and solved. With a view to attaining this goal, action has been taken on two fronts--on the one hand, the providing of suitable equipment and, on the other hand, the shifting of the center of gravity of the applications of computer technology from the problems of economic administration to the scientific and technical ones.

In approaching these aspects, the start was from the finding, quite well founded, that the nature of the concerns specific to a computer center that belongs to a technological research and development institute differs substantially from that of a territorial computer center and, consequently, the utilization of just a general-purpose computer that processes the batches of jobs is insufficient. This is precisely why there have been undertaken the achievement of an integrated data-processing system, devoted to computer-aided research and design (CPAC), and, at the same time, the distribution of the computing power by designing and implementing a network of terminals--in the future, one of computers--that connects the institute's laboratories and branches to the computers installed at the computer center.

The integrated system devoted to computer-aided research and design is viewed as a symbiosis between two subsystems, the /hardware/ /in boldface/ one (including the equipment), as support for the other subsystem, the /software/ /in boldface/ (containing the basic programs), which would make real, efficient collaboration possible between the engineer (researcher or designer) and the computer, each taking over the work that is right for each--the former, that of creation, and the latter, that of routine. The hardware subsystem, well defined at present, is composed of a structure of specific graphic terminals (graphic display, digitizer, graph plotter) and standard terminals coupled to minicomputers of the Independent and CORAL /expansion unknown/ type. In proportion as this subsystem is equipped with the necessary basic programs, it allows the preparation of complex technical and technological designs.

As regards the reorientation of the problems toward scientific and technical applications, the following major objectives have been established: the raising of the level of productivity of the research work and the level of competitiveness of its results; the helping of the specialized industrial units by devising methodologies regarding computer-aided technological and construction design; the development of equipment run by computers, for various phases of the industrial processes in the coordinated branch; the tackling of research for devising equipment that includes elements of artificial intelligence. In

the context of such concerns, the ICPE Computer Center is pursuing the solution to problems with direct implications for raising the efficiency of the activity of the research and design units and the production units.

With the first phase of the "technological flow" of research being documentation, a constant concern for what is called "documentary data processing" has developed within the ICPE. This has been concretized in its own system of automatic documentation (ICPE-ARIEL /expansion unknown/), which contains a large volume of data coming from the indexing of many specialized articles and books. At present, the interactive variant of the system has also been achieved, there being in the course of finalization the network of terminals that will permit direct access by researchers in laboratories to the data stored in the computer.

The problems of simulation with the computer's help occupy an important place in the activity of the computer center. In order to allow the researcher to know as thoroughly as possible and in a short time the phenomena and processes analyzed, a number of mathematical models that constitute a formal representation of the phenomena and processes in question have been achieved. These models are transformed into programs that, put into the computer, offer the possibility of obtaining, in a short time, comparative data on several variants of possible solutions and of analyzing various working hypotheses. In comparison with the conventional methods, the utilization of mathematical modeling and computerized simulation leads to a substantial reduction in the duration of the research and development cycle. Among the topics handled in this way it is possible to mention: the optimization of the geometry of cryogenic coils and the calculation of the homogeneity factor; the study of the distribution of the magnetic field in special electric machines; the study of the transitory regime of the heating of electrical contacts in a vacuum and in air; a package of programs for nondestructive magnetic fault detection; the study of the magnetic field in synchronous couplings equipped with permanent magnets.

Within the framework of the same concern, that of a reorientation toward acutely topical problems, which would harness as fully as possible the resources of computers, the ICPE-CEE /Computer Center/ has tackled a new "front" of the battle for the new, it being involved, among the first data-processing units in the country, in a recently appearing field such as "industrial data processing." This field came into being through the attachment of new directions--such as computer-aided technological and construction design and the design and implementation of computerized equipment for various phases of the technological processes--to the concerns--now conventional--referring to data-processing systems for general administration. Among the most representative tasks of industrial data processing tackled by the ICPE-CCE there are: the computer-aided construction design of the SDV's /tools, devices and gauges/ specific to the electrical-engineering industry; the computer-aided design of asynchronous three-phase gyromotors; the computer-aided design of direct-current servomotors with a rotor disk and an axial airgap; the computer-aided design of single-phase transformers; systems of basic programs for the process-coupling analog unit and for the subsystem of regulatory reserves in the SDC 2050 distributed control system; an operating system for multiple controllers with 16-bit microprocessors; a package of basic programs for installations for measuring in

three coordinates, run by a computer; basic software for a multimicroprocessor system for control of complex machine tools; a test bench for gyroscopic blocks, run by a microcomputer; test equipment for chips containing large-scale integrated circuits; a development system for systems with microprocessors; an enterprise data-processing system for the electrical-engineering and electronics branch; a data-processing system for scientific research and technological engineering units; a system and method of optimization of imports for the MIMUEE /Ministry of the Machine Tool, Electrical Engineering and Electronics Industry/; a study on the standardization of the sheets used in rotary electric machines and in electric transformers, with a view to reducing the consumption of electrical sheet metal.

Once finalized and implemented, all these things will help substantially to improve the technical and economic parameters of the products of the electrical-engineering and electronics industry, to reduce the consumption of energy and scarce materials, to modernize the technological flows through the expansion of automation, "electronicization" and robotization, and to raise the qualitative indices of the information and decisionmaking processes in the conception and production units in this important branch of the economy.

While concerning themselves with modernizing the activity of other units, the specialists of the ICPE Computer Center are seeking, at the same time, to continually improve and raise the efficiency of their own activity. In this direction go the efforts to organize the "technological flow" of the data-processing activity according to modern principles, starting from the premise that, in the current stage, the devising of program products has become an industrial-type activity, that we are living in an era of very strong development of the "software industry." Such considerations, combined with the highly topical tasks that face the ICPE-CCE, have led to the conclusion that it is necessary to implement new organizational working principles and new methodologies of production, of providing quality and of marketing--that is, it is necessary to apply the principles validated by engineering to programming, with a view to securing an efficient and very versatile data-processing output of a high qualitative level. Along this line of concerns, besides the generalization of the utilization of various methods now "conventional" (structural programming, the securing of the testability of programs in the design phase and so on), there is an accent on the generalization of an interactive development of programs, on the direct introduction of data onto magnetic media, and on the utilization of modern, highly flexible and productive programming languages (PASCAL, LISP, C and so on).

At the same time, special attention is being devoted to retraining the specialized personnel with a view to their multilateral qualification and, in general, for as good utilization of the work force as possible. In this regard, provision has been made so that the majority of the programmers may know several high-level programming languages, programming techniques for various applications, and techniques of teletransmission or of management of technological processes. There are staffs specializing in the production of software (programs) for microprocessors and for complex multimicroprocessor systems. Suitable methods of developing programs for microprocessors--both for specialized microcomputers for certain fields and for big computers (multitasking)--have been devised or perfected in these staffs.

At present, the most efficient methods of carrying out actions in the future are being examined within the ICPE Computer Center, with the attention being focused mainly in two directions: the tackling of certain new data-processing fields of great practical interest and the development of activities and projects of international cooperation. As regards the first direction, the research for devising control blocks for programmable industrial robots and equipment with artificial intelligence, including expert systems, is relevant; referring to the second direction, the development of the exportation of finished program products and some work of cooperation in devising software specific to scientific and technical applications are in view.

The experience accumulated by the specialists of the ICPE Computer Center and data processing's trends of progress in a number of countries in which this field is advanced demonstrate that the utilization of the means specific to computer technology constitutes a highly efficient method of attaining a high level of labor productivity and of competitiveness of the products achieved in various fields.

For instance, one of such directions, a far-reaching one, is the achievement of complex systems for teleprocessing of data, based on modern teletransmission networks, furnished with high-performance equipment with high reliability. This can allow the existing computer resources to be utilized more efficiently and the number of users who have access to computers to rise substantially, without making big additional investments. It can be mentioned in this regard that the basic nucleus (a structure with three nodes) of the national computer network was recently achieved by the Institute of Management and Data Processing, in collaboration with other specialized bodies, thus fulfilling an important task put before our specialists by the 12th congress of the party. By equipping the production units or the research and design units with a suitable number of terminals, along with expanding the teletransmission network, it is possible to obtain a big increase in the area of penetration of data processing, with minimal investments as regards the information and production structures.

Another very topical direction is the devising of a new generation of computer systems. In fact, the concerns for solving the second category of problems are included here. The first category results from the shortcomings of the current generation of computer systems, shortcomings that have as a basis the tendency that the designers have manifested thus far to improve particularly the performances of the central components of computers (operating speed, storage capacity and so on). As a result, the operations on the peripheral components (data inputs and outputs) are still done in an unwieldly way, which negatively affects the overall performances of the computer. In order to eliminate these shortcomings, many research and development staffs in various countries, as in our country, have initiated research whose aim is to improve the mode of communication between the operator and the computer, through the use of sound (speech) and, in addition, images (the reading of documents), to implement natural language as a principal language for computer programming, and to achieve subsystems specializing in form recognition (on the basis of digitizing the images).

The second category of problems is generated by the attempt to achieve systems with artificial intelligence. Such systems could make it possible to perform certain reasoning and deductions with the computer's help, using the data base in a certain field (knowledge bases) and specialized processors for nonprocedural languages (LISP, PROLOG and so on). The achievement of "expert systems" constitutes the main application of such "intelligent" computers. The expert system associates the qualities of an advanced computer (a high operating speed, a big memory, an ability to "reason") with the experience of a specialist in a field, with a superperforming man-machine complex being able to result from this combination.

For example, the field of medicine is very enlightening as to the way in which an expert system can be used and the advantages that it offers. In this case, the system could be composed of an advanced computer (a computer system with artificial intelligence) and a set of specific electronic apparatus (electrocardiograph, electroencephalograph, tomograph and so on) connected directly to its memory, which permit the collection of information on the biological condition of the pacient. The hardware subsystem (equipment) would be supplemented with a knowledge base containing the relationship between symptoms and illnesses. The input data in the system would consist of the set of information received from the specific apparatus and of that inserted by the physician through the operator console. Processing this data, the expert system offers variants of diagnosis, from which the physician selects the variant regarded as more suitable and tells it to the system. In the next phase, the system offers variants of treatment. Finally, it memorizes the data characteristic of each patient, in order to be able to "remember" them at the next consultation.

On the basis of a standard structure, expert systems can be constructed for practically any field. The advantages of using such a system are obvious: the offsetting of possible deficiencies in the specialist's memory or training, the considerable shortening of the time needed for determining the optimum decision that is to be adopted and so on.

Another highly topical direction is the construction of advanced industrial robots. Besides the characteristic of programmability, they will also have to have rudiments of intelligence--that is, to be able to adapt to changes occurring in the environment in which they operate. In order to attain this objective, there will be undertaken the designing, for robots, of control blocks that contain processors specific to systems with artificial intelligence, as well as subsystems for image analysis and form recognition. The meeting of these requirements will allow the substantial expansion of the field of use of industrial robots and the rapid growth of their economic efficiency. The achievement of a varied family of industrial robots, starting with simple manipulators and ending with intelligent robots, having higher and higher productivity, will open up, in the future, wide possibilities of replacing man's labor in the cases in which it entails routine or great physical efforts, as well as in environments with considerable noxae (radioactivity, toxicity and so on).

The aggregate of such highly topical or long-term concerns indicates the wider and wider implications of data processing in the most diverse fields of

activity. Although, initially, computers were associated mainly with the work of economic administration, the sphere of their use has expanded rapidly, they now becoming more and more an auxiliary of prime importance not only in the solving of problems of economic and social organization and management but also in the field of scientific research and technological design. In this direction go the concerns within the ICPE Computer Center for the development of data-processing applications in research and design, with a view to raising the general efficiency of these activities.

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